MODERN Machine Shop

HOWARD CAMPBELL, Editor

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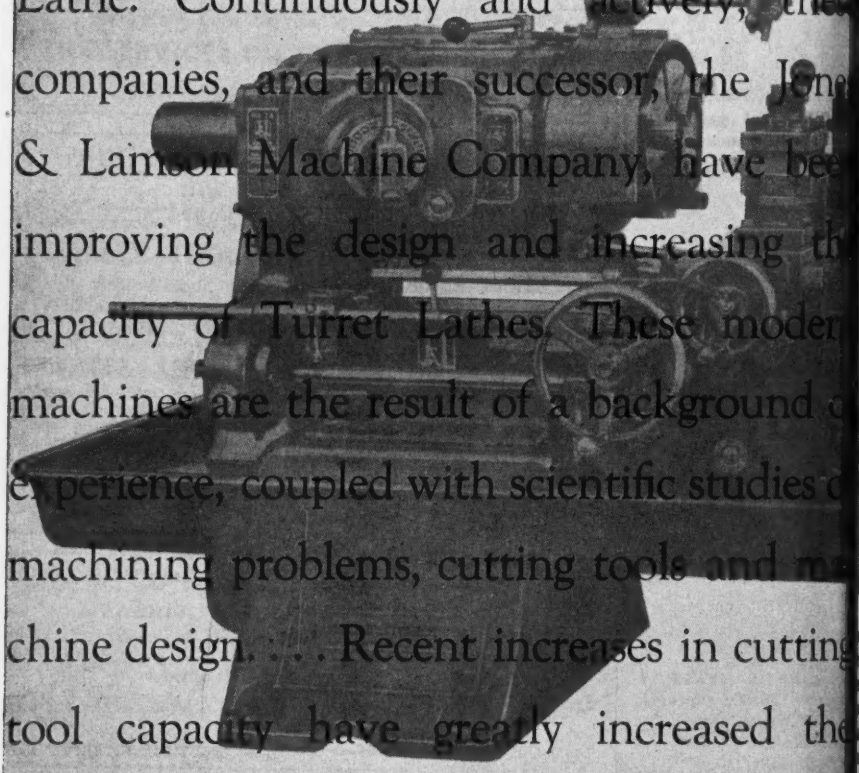
IN 1848, the parent companies of Jones & Lamson designed and built their first Turret Lathe. Continuously and actively, these companies, and their successor, the Jones & Lamson Machine Company, have been improving the design and increasing the capacity of Turret Lathes. These modern machines are the result of a background of experience, coupled with scientific studies of machining problems, cutting tools and machine design. . . . Recent increases in cutting tool capacity have greatly increased the load which a machine must carry. There is every reason to believe that the near future will see that load grow steadily greater. . .



MODERN
Machine Shop

CINCINNATI, OHIO

ECEMBER, 1938 VOL. 11, NO. 7

Most Modern Production Plant Layout

ternational Harvester Plant at dianapolis Exemplifies Newest eas in Production Equipment and Methods

NTERNATIONAL HARVESTER COMPANY'S new Indianapolis ck Engine Works, now getting into ide in the production of engines for company's line of International tor trucks, provides an illuminating dy in modern plant construction, duction layout, and production thods and operations involving the of precision equipment. The plant, it now stands, contains 363,000 are feet of floor space in the manuturing building and 260,000 square in the foundry unit, with the er plant adding to the total. Both manufacturing building and foun- are one-story structures of the steel-skeleton type with sidewalls of brick and glass, poured gypsum roof decks, and bonded gravel roofs.

Corrugated glass is used in the side walls and the continuous roof sash, affording unexcelled natural light. Two thousand 350-watt Cooper-Hewitt mercury lights in the manufacturing building enable night shift employees to work under the same lighting conditions as the day shifts.

The present plant capacity is 680 truck engines per day, but the buildings have been designed and situated with a view toward an ultimate daily capacity of 2000 engines. In the construction of this plant the Harvester Company followed a practice which has become standard for all of the company's new plant structures. In

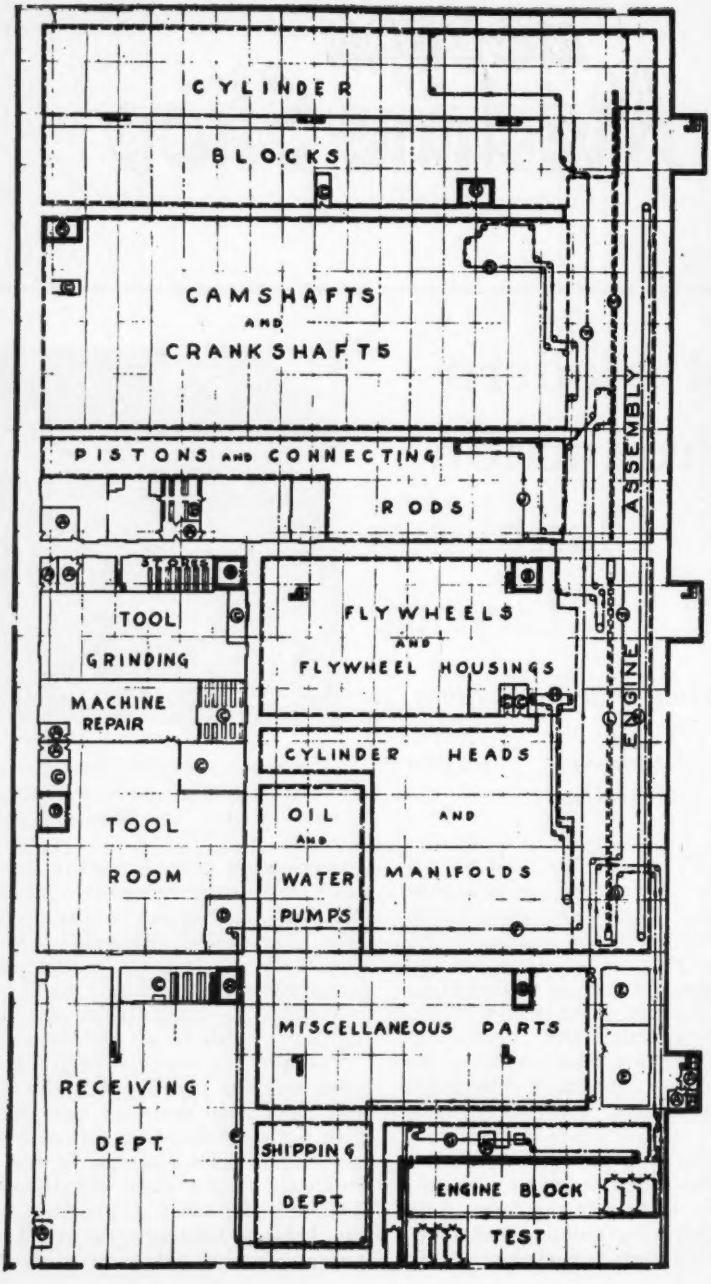


Fig. 1—Floor plan of new International Harvester Company Truck Engine Works manufacturing building. Rough stock is brought into the building via the aisle along the left wall and progresses across the plant through the various machining operations, ultimately reaching the engine assembly line at the point where it is to be assembled to the engine.

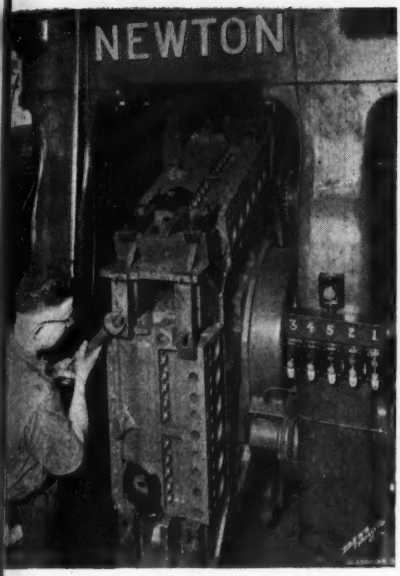


Fig. 2—Tops and bottoms of cylinder blocks are machined in this Newton heavy duty drum type mill. A five-station fixture provides for continuous operation.

▼

The manufacturing building is 825 ft. long and 440 ft. wide, including a 33 ft. wide receiving and shipping dock that runs the full width of the building at one end. In laying out the equipment for this unit, the objective was to obtain utmost efficiency in manufacturing two distinct lines of engines in 10 sizes and 12 models to meet the needs of the International line of trucks. Two parallel engine assembly lines, with a 20-ft. aisle between them, extend more than half the length of the building on one side and all parts production lines extend across the plant at right angles to the main assembly lines. The lines of production machines are so arranged that they intersect the subassembly lines at the nearest possible locations to the stations where the particular subassembly joins one of the main assemblies. The sequence of the parts manufacturing lines is: cylinder block, camshaft, crankshaft, piston, connecting rod, flywheel housing, flywheel, cylinder head, and miscellaneous department.

a special study made by Harvester industrial and construction engineers on comparative manufacturing costs between multiple and single-story buildings it was found that manufacturing costs are substantially reduced by having all departments on one floor. The study also developed the fact that bays of 22 x 33 ft. are of the most economical size, according two or three machine lines and providing the required aisles for moving materials.

▲

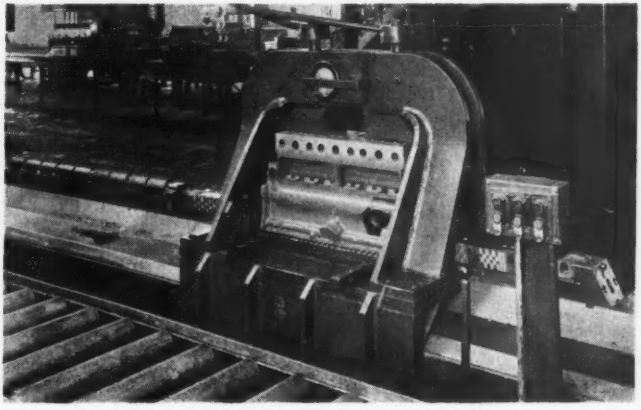


Fig. 3—In this Cincinnati horizontal broaching machine, a combination circular and flat surface broach is used to broach the crankshaft bearing bores and sides in the crank case. This method assures accuracy in alignment of crankshaft bearings as well as in size and finish.

ing the engine assembly like at the point where it is to be assembled to the engine.

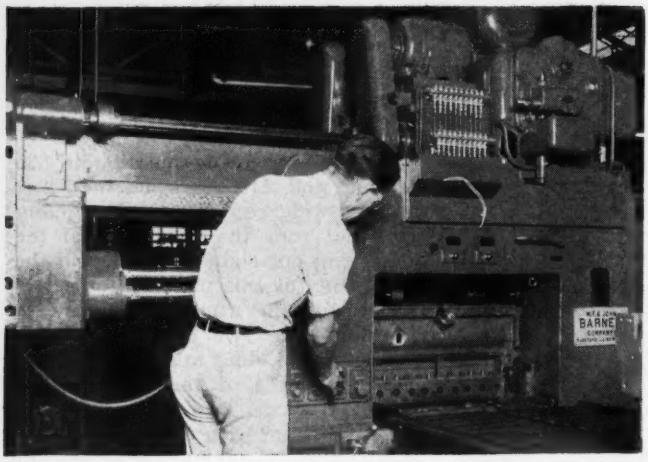


Fig. 4—Camshaft and crankshaft bearing holes are finished simultaneously in this W. F. & John Barnes precision boring machine, assuring perfect alignment for the camshaft and crankshaft.

All rough stock and parts are delivered in the manufacturing building directly at the points where they are needed and progress, as they are machined, toward the assembly lines. More than three miles of conveyors in the manufacturing building, divided about equally between the roller type and the trolley type, reduce trucking of parts and stock to the minimum. The material handling systems include a total of 8200 lineal feet of roller conveyors, and over 8000 lineal feet of trolley systems carrying 3000 hooks. One conveyor alone delivers approximately 75 tons of materials daily from the stores department to the assembly lines. Thirty Cleveland tramrail systems, including both the monorail and crane type and equipped with both electric and hand rope hoists, are also used.

The first line of production machines, extending across the front end of the building, is the cylinder block line, and the first operation on the block is that of rough and finish milling the top and bottom of a cylinder block. For this operation a Newton heavy duty drum type mill, shown in

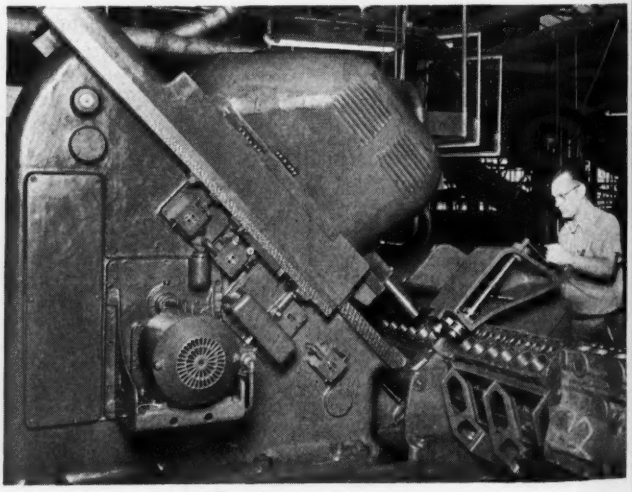


Fig. 5—The six cylinder bores are machined to size simultaneously in this W. F. & John Barnes precision boring machine. The cylinder block is automatically located, clamped, and bored. Firthite tool bits are used, operating at a speed of 534 surface feet per minute.

Fig. 7—The cylinder bores are finished by honing preparatory to pressing in the sleeves. A mirror-smooth finish is produced by this method.

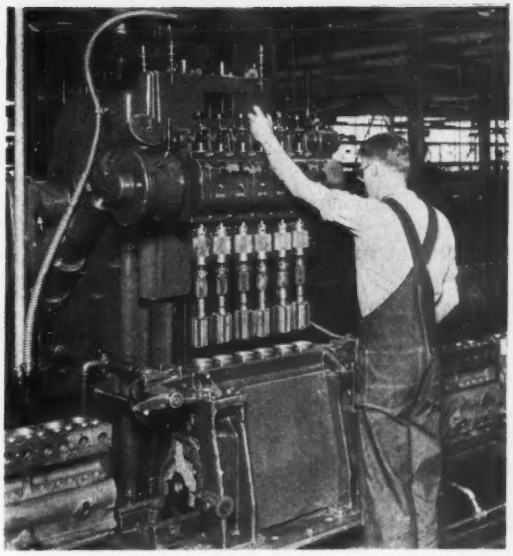


Fig. 2, is used, the fixture being designed to hold five blocks. The roughing cutters are located at the top of the drum cycle and the finishing cutters at the bottom. From $\frac{3}{32}$ to $\frac{1}{8}$ in. of stock is removed from each side, the roughing cutters leaving approximately $\frac{1}{32}$ in. to be removed in the finishing cut.

After leaving the Newton mill, the cylinder block passes to the Cincinnati horizontal hydraulic broach shown in Fig. 3, where a circular broach is used to finish the main bearing cap seats and flat surface broaching tools finish the main bearing cap seats. The illustration shows the flat broach in the midst of the operation. Approximately $\frac{1}{8}$ in. of stock is removed by the broaching tool in this operation.

After leaving the broach, the bearing cap holes are drilled and other miscellaneous holes in the cylinder block are drilled and tapped and the block is then passed to the W. F. & John Barnes precision boring machine illustrated in Fig. 4, where the camshaft and crankshaft bearing holes are finished simultaneously. A feature of this machine consists in that it is fully automatic and can not be started if the work is not properly located in the machine. The machine and tools are designed to assure accuracy within the required limits of 0.0005 in. for size and 0.0003 in. for out-of-round. Machining the holes for both shafts in one operation also assures perfect alignment.

All cylinder bores are fitted with sleeves, this type of construction ensuring a minimum of maintenance costs when the block is in service.

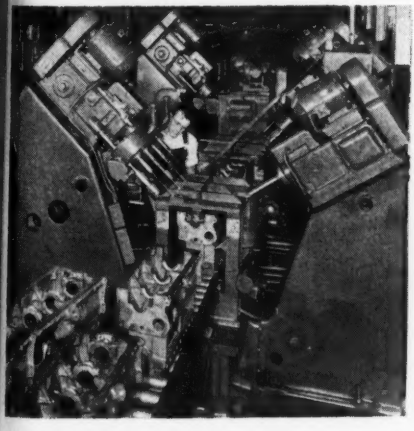


Fig. 6—All miscellaneous holes in the cylinder block are drilled and tapped in this combination W. F. & John Barnes machine. The block is automatically located and clamped and is automatically indexed through three stations.

The fact that sleeves are used does not lessen the need for accuracy in machining the cylinder bores, however. The illustration Fig. 5 shows a special six-spindle W. F. & John Barnes precision boring machine designed especially for International Harvester for finish boring six cylinder bores in one operation. The cylinder block is automatically located and clamped and the machine is fully automatic in operation. Firthite boring tools are used, operating at a speed of 534 surface feet per minute and machining the bores within limits of 0.001 inch.

The two W. F. & John Barnes machines shown in Fig. 6 are drilling and tapping the miscellaneous holes in the cylinder block. The combination machine is fully automatic, being controlled from push button panels which automatically locate and clamp the block. The machine indexes the block through three stations. Should one clamp or spindle fail to operate, the whole machine is automatically stopped, thus preventing breakage of tools and incorrect machining.

The last operation on the cylinder bores before the sleeves are pressed into place is that of sizing and finishing by the honing method, for which the six-spindle honing machine shown in Fig. 7 is used. Each hone carries four stones, the hone being designed so that the stones can be set to any desired diameter within the limitations of the tool. Operating at a speed of 72 reciprocations (round trip) per minute, approximately 30 strokes are required to a block. Approximately 0.0025 in. of stock is removed and the bore is finished within 0.0005 in. for diameter and taper between ends.

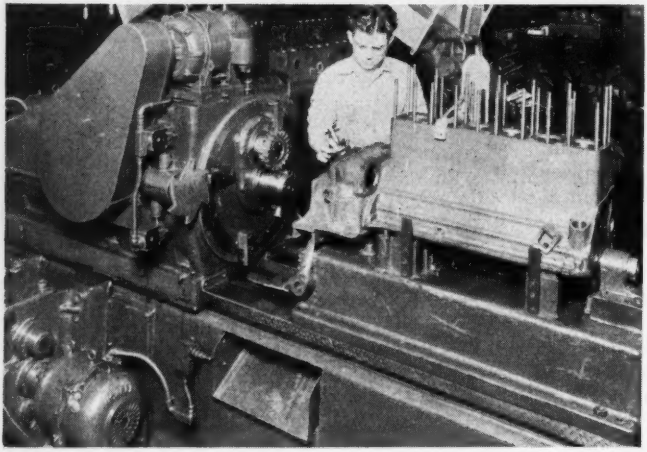


Fig. 8—Perfect alignment of the transmission and engine assembly is assured by facing and boring the transmission face of the flywheel housing after assembly to the cylinder block. The work is located from the crankshaft bearing holes.

The transmission face of the flywheel housing is finish faced and bored after assembly to the cylinder block, for which the W. F. & John Barnes machine shown in Fig. 8 is supplied. Performing this operation after assembling the two parts assures perfect alignment. It is interesting to note that the block is located from the crankshaft bearing holes. Due to the fact that the work has been moved back away from the tool, both the boring and facing tool can be seen in the illustration. At the front side of the headstock can be seen the star which controls the boring tool feed. Four dogs on the face plate strike the points of the star in turn with each revolution

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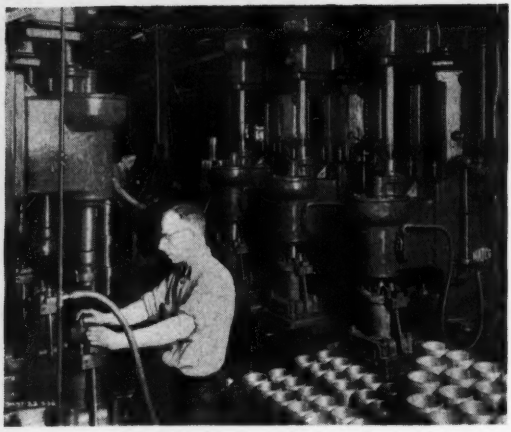


Fig. 9—Cylinder sleeves are finish reamed in this battery of six single-spindle Natco's.

of the spindle. A Firthite cutter is used and the diameter of the bore is held to 0.001 in. limit.

The illustration Fig. 9 shows a battery of six Natco single-spindle machines which are used for finish reaming the cylinder sleeves. The reaming operation is performed with Barber-Colman expansion reamers which are of unusually sturdy construction and are easily adjusted to size. One operator runs the six machines, the time required for changing pieces being very small in comparison to the amount of time consumed in the reaming operation.

The operator shown in Fig. 10 is sliding a cylinder sleeve into position on the Sheffield shadow gage preparatory to checking the sleeve for size, out-of-round, and taper. There are three gaging points, set into a cylindrical part resembling a shaft. As the sleeve is slipped over the shaft it bears on these three points and the diameter and concentricity are indicated by the "light and shadow" of the gage. The diameter of the sleeve is held to within 0.0001 inch.

The top and bottom surfaces of the cylinder heads are finished by broaching in the machine shown in Fig. 11. This machine is a single-ram horizontal broach especially built by Cincinnati Milling Machine Company for this operation. The heads are located for machining in a power-operated index fixture which enables the operator to load one station of the two-station fixture while the machine is in operation.

Two pieces are processed simultaneously, one on the top and the other on the bottom. After machining, the fixture is revolved to bring these parts to the upper position where the part that has just been finished on the bottom is automatical-

Fig. 10—A Sheffield shadow gage is used to check the size, out-of-round, and taper of cylinder sleeves.

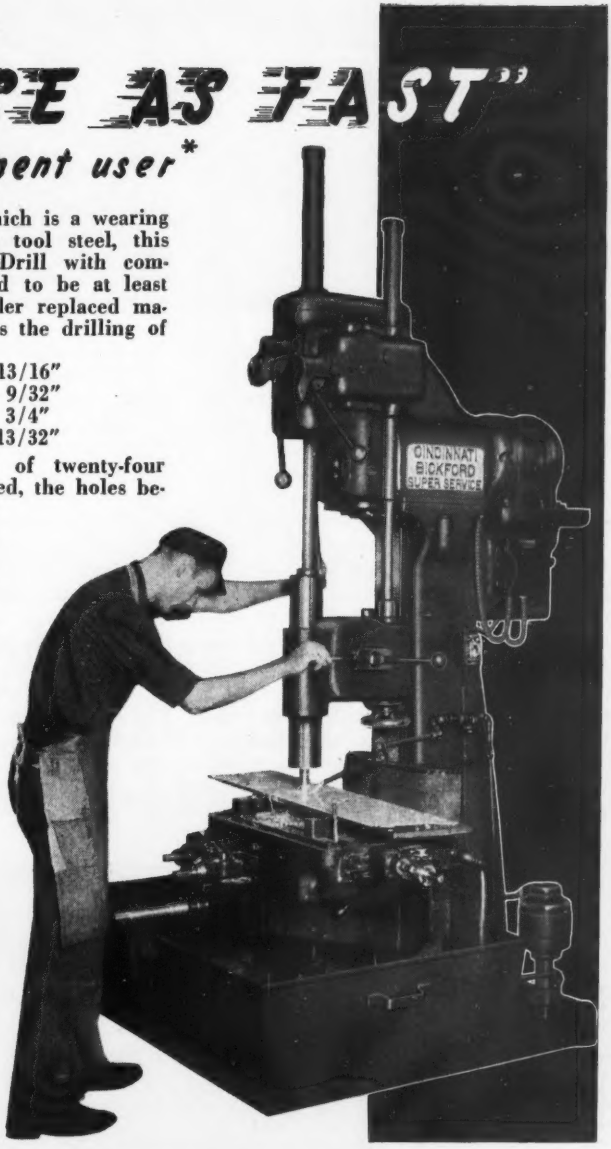
"At least TWICE AS FAST" says prominent user*

On the work shown, which is a wearing plate of oil hardening tool steel, this Super-Service Upright Drill with compound table, is reported to be at least twice as fast as the older replaced machine. This job involves the drilling of holes

two 1-13/16"
two 1- 9/32"
four 3/4"
twenty-four 13/32"

and the counterboring of twenty-four ¾" holes. No jig is used, the holes being located with the aid of the compound table and center-distances held to limits of ±.005". Time required is now 1½ hours, former time 3 hours. A similar replacement and like savings may be possible in your shop. Write for complete information.

Customer's name on request.



THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

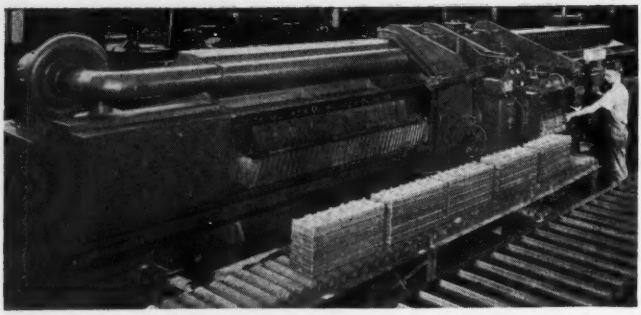


Fig. 11—The top and bottom surfaces of the cylinder head are machined in this single-ram horizontal Cincinnati broaching machine. The ram of this machine is powered by five centrifugal hydraulic pumps.

ly moved out of the fixture and into a holder, shown at the right in Fig. 12. The fixture is then again revolved to bring the remaining head and empty fixture receptacle to the front at which point the head in the holder, now swung into vertical position, is moved into the empty fixture in reversed position. The finished piece is removed and replaced with a rough head and the fixture is ready for swinging into machining position again. Thus at each cut a new head is machined on the first side and the other head is machined on the second side, so that a complete head is produced in each operation. The head is held to within limits of 0.002 in. on the thickness and parallel of the finished surfaces.

Power to drive the cylinder head broaching machine ram is supplied by a combination of five centrifugal hydraulic pumps, and a "Roto-Clone" draws off and carries away the dust. Operated by push buttons, the machine is equipped with an electric eye which prevents the machine from operating if the work is not properly clamped, or if the operator's hands are in the danger zone. The beam of light passes from the lamp attached to the upper right front of the machine at the operator's station to the cell located at the lower left as shown in Fig. 12. If the work is not properly seated in the fixture it will interfere with the passage of the light beam, the full force of which is necessary to the operation of the switch.

(The second half of this article will be published in the January issue.)

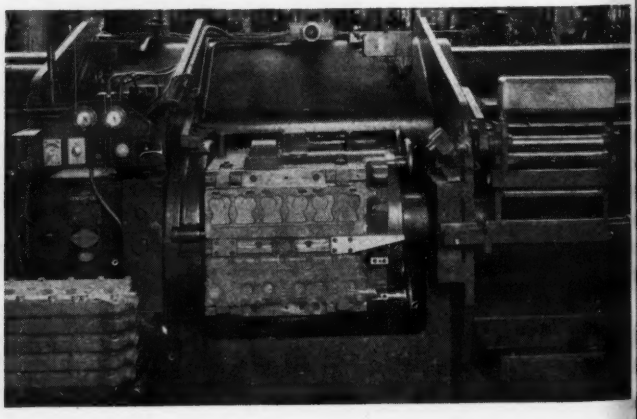
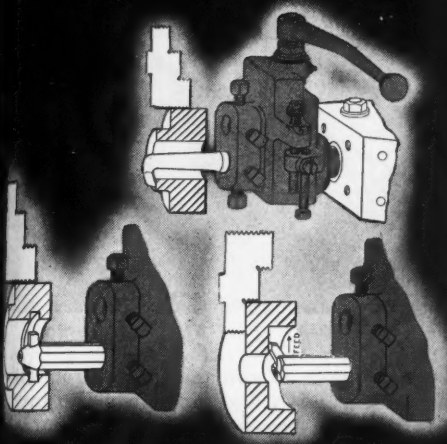
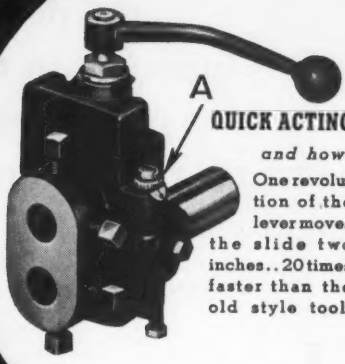


Fig. 12—Loading station of cylinder head broaching machine. One top and one bottom surface are machined simultaneously, producing one complete head at each operation of the machine. An "electric eye" prevents operation of the machine if the parts are not properly clamped or if the operator's hands are in the danger zone.

If you do Recessing, Back Facing or Inside Facing on Hard or Soft Metals





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Superfinish---

the newest development in the finishing of metal surfaces for smoothness and accuracy

By HOWARD CAMPBELL

IT IS probable that the abrasive method of removing projections from rough surfaces is one of the oldest manufacturing operations known to man. Indeed, it is not unlikely that, previous to the discovery of metals, the cave-man rubbed one stone against another in order to produce some semblance of an edge on his stone axe, and probably used a rough stone to shape the small end of his club so that he could grasp it more easily.

The discovery of metals gave a new importance to abrasives, and in the course of time it was found that certain kinds of stones lasted longer and cut better than other kinds. The development of tools fostered a continuous search for stones of better quality, sandstone being considered the best for several centuries. In fact, grindstones made from sandstone were used in the earlier days of our industrial age for sharpening tools and for shaping and polishing hard materials. Sandstone is a natural grindstone material in which grains of quartz are held together with a bond of silica.

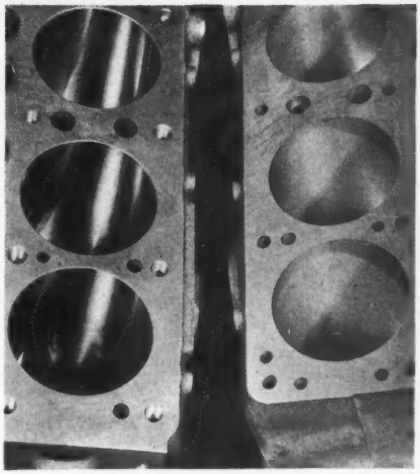
The grindstone was too soft and the cutting action was too slow, however, to make it valuable as a production tool, and it was only upon the invention of the emery wheel, about the middle of the last century, that abrasives became of prime importance in manufacturing. The emery wheel presented an economical means for sharpening tool steel cutting tools, for removing bumps and projections from rough castings where machining was unnecessary, and—when mounted in connection with a work-driving and traversing mechanism—for producing a surface finish that was impossible or difficult to produce with a cutting tool.

The power-driven grinding machine was for many years considered the one best method of producing accuracy and finish on both external and internal work. Some sixteen or eighteen years ago, however, a tool for internal finishing was developed consisting of several fine abrasive stones arranged about an expanding center. The tool was not intended for the removal of stock in quantities, the action of the stones being intended for polishing rather than for grinding, but the finish obtained was superior to any that had been economically possible previously.

The internal honing tool has large- been accepted by industry for im- arting the final finish to internal lindrical surfaces, but little effort, ther than the application of emery oth by means of crude wooden amps, has been made in the direc- on of mechanical means for impart- g the same kind of finish to ex- rnal surfaces. Now, however, after ree years of experimentation and search, the production research en- neers of the Chrysler Corporation ve developed a method called Superfinishing" whereby the prin- ple of the hone or lap can be applied external surfaces in such manner at the surface variations can be ntrolled within a fraction of a mil- onth of an inch.

The principle upon which a Super- inishing machine is designed varies om the principle of the lap in that ixed abrasive stones are used. Thus e stones can be controlled to pro- uce a flat and even surface whereas apping, which is done with abrasive paper or cloth, follows the existing contour—which may be irregular.

Crankshaft bearings and pins, pis-



The illustration shows the bores in two cylinder blocks, the one at the right before Superfinishing, and the one at the left after being Superfinished.

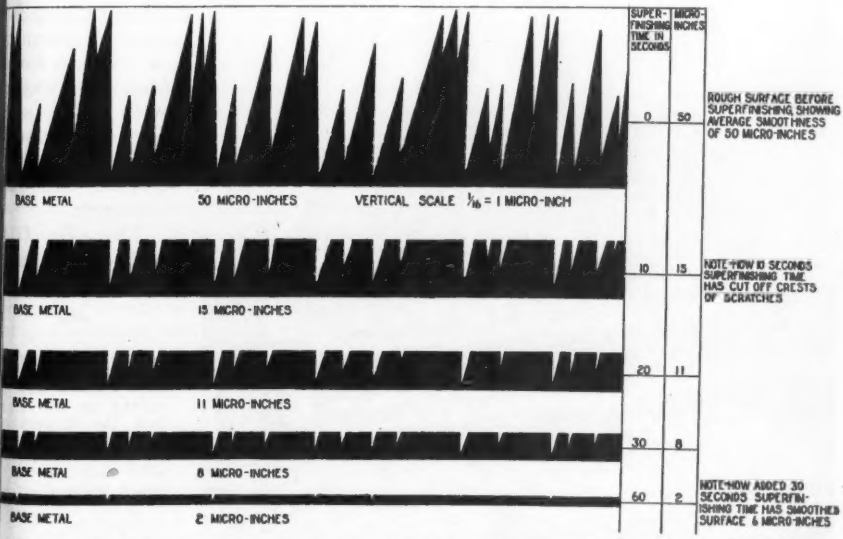
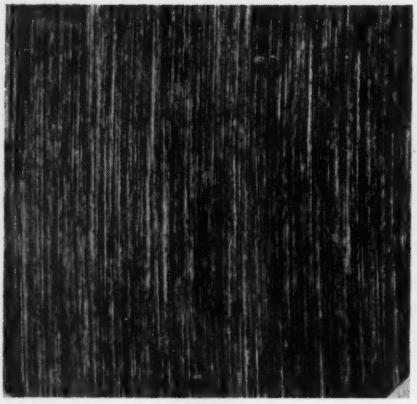
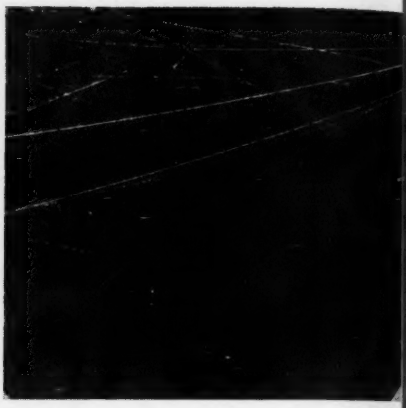


Diagram Showing Development, by Superfinishing Process, of Smooth Surface from Relatively Rough Surface



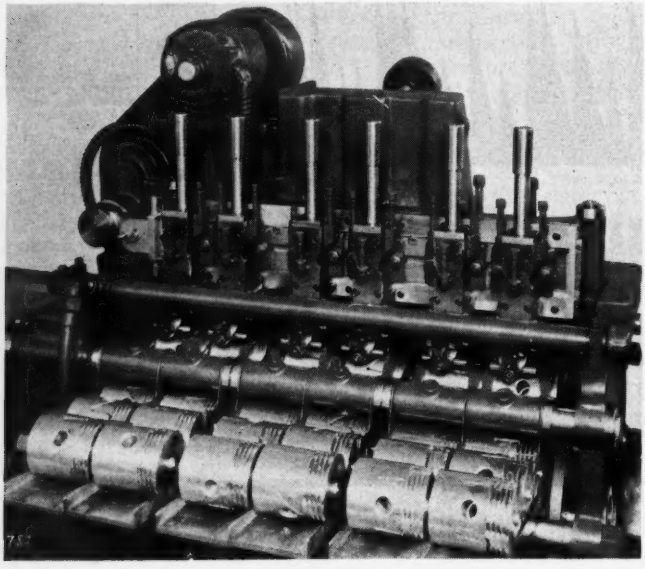


Photomicrograph of section of aircraft ring before and after Superfinishing. Surface variation before, 9 micro-inches. After Superfinishing, 2 micho-inches.

ton pins, camshaft bearings and cams, pistons, tappet heads, valve stems, flywheel clutch faces, brake drums, and even brakeshoe lining can be Superfinished on a production basis to such a point that the variations in allowable surface roughness are negligible —even on work where the allowable surface variation may be two millionths of an inch.

Speaking of measuring surface variations within two millionths of an inch brings up the question of the type of instrument with which such infinitesimal variations can be measured. It is interesting to note that, coincidental with the development of Superfinish, Dr. E. J. Abbott of the Physicists Research Company of Ann Arbor, Michigan, was developing such an instrument, which he later termed the Profilometer.

The Profilometer consists es-

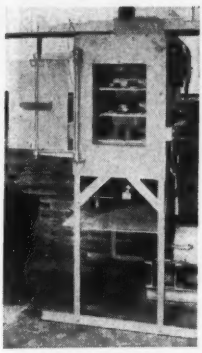


In Superfinishing aluminum pistons the pistons are revolved at 460 r.p.m. and the Superfinishing stones reciprocated at 240 reciprocations per minute. The rough ground surface, varying 35 micro-inches, is Superfinished to 5 micro-inches in less than 30 seconds.

Tips ON TOOL H[illegible]TREATMENT

reful Preheat Saves Distortion

ating a tool or die rapidly through low temperature ge is one of the st common causes size change and rpage. Tool de-ign, of course, has great deal to do ith the tendency of tool to warp when is quenched. One ith drastic changes section can ordi-arily be expected warp more than a mple tool.



Box Type Cyclone Tempering Furnace

he heat treater however, can, by proper pre-ating greatly reduce distortion. *All* tools and es should be preheated slowly and uniformly. arbon steel tools can be preheated to 750° or 0° F. in the tempering furnace before they e exposed to elevated temperatures. Much of e danger of excessive distortion is then elim-ated. High speed tools should really have preheats; one at 750-800° F. until thoroughly aturated, then another thorough preheat at mperatures from 1400-1650° F. before the ork is put into the high heat furnace.

he matter of using the tempering furnace for e 750-800° preheat is one of the reasons why ox type tempering furnaces are so widely used tool rooms. The work is easily visible as it is aded on shelves as shown in the illustration. Pieces can be loaded and removed without disturbing others which may require a longer heating. Uniform temperatures from 250° to 1250° are obtainable and changing from one temperature to another is accomplished quickly.

The new special atmosphere hardening furnaces also assist in the problem of reducing distortion because in them steel heats more slowly. There is also a tendency for the operator to give plenty of time for soaking because he does not have to worry about scaling or decarburization.

All of which is just a long way of saying what every tool maker and steel maker has so often specified, "heat slowly and thoroughly to temperature."

Preheat and High Speed Hydryzing Furnaces for tool and die hardening

Lindberg Engineering Co.
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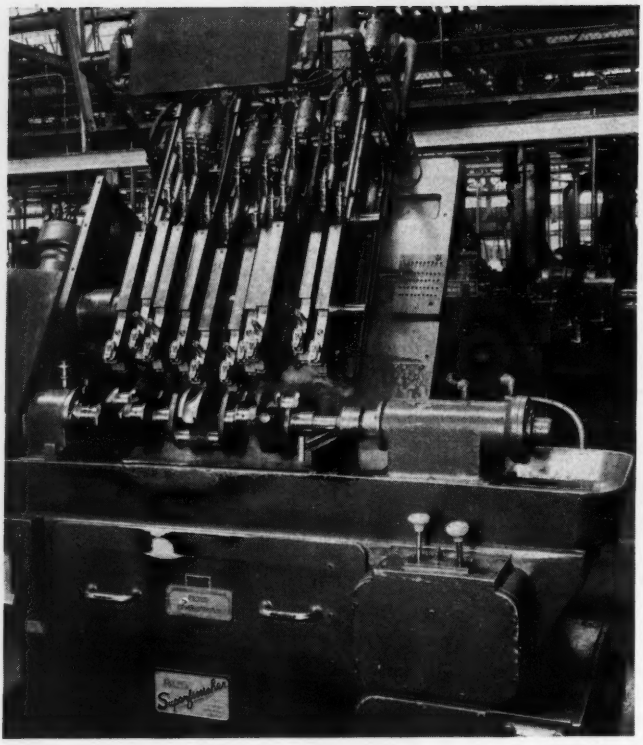
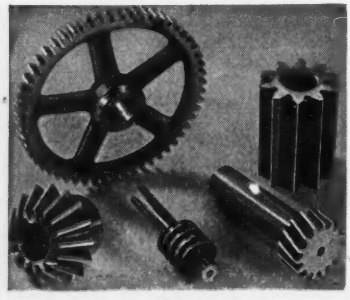
Lindberg *Furnaces*



Crankshaft pins and bearings are Superfinished in this machine. The arm carrying the stone for Superfinishing the pins reciprocates as the shaft revolves, maintaining an even pressure on the work at all times.

sentially of a tracer unit carrying a fine tracer point the upper end of which passes through a coil. As the tracer point is moved over the work-surface, the surface irregularities cause the stem to vibrate in the magnetic field, and this movement is transmitted to the meter. Thus the meter reflects the variations in the surface over which the point passes are indicated, in micro-inches (millionths of an inch), on the dial of the instrument. With this instrument an operator can take a continuous running average of the height of surface irregularities, the reading being taken in micro-inches. Estimates can be made as low as a tenth of a millionth (0.0000001). This instrument shown in use at the head of this article, is used continuously for checking the surfaces produced by Superfinishing Chrysler Corporation automobile



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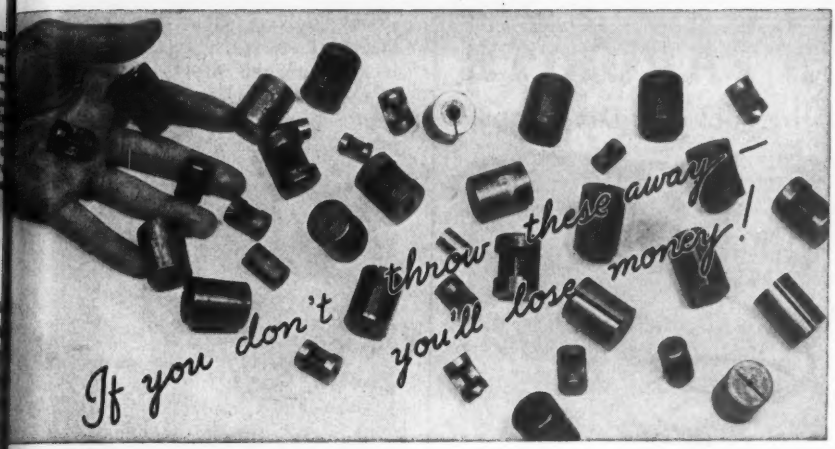
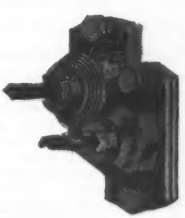


THAT may sound like a paradoxical statement. You probably have a considerable investment in bushings for use with your screw machines. But the fact is, that the longer you use bushings, the more you'll have to spend. Many wise manufacturers—those who watch every opportunity to lower their production costs—have already equipped their screw machines with ALCO Drill Chucks and ALCO Tap Holders. These new tools fill a long felt demand for adjustable, self-compensating, concentricity insuring tools which do away with bushing bothers, tool room interruptions, production delays, idle machines and bushing costs. They will improve the quality of your output, speed up your production and lower your production costs. The cost of these tools will soon be amortized by the economies effected. Like other wise screw machine users, "Go thou and do likewise." Write today for full particulars. Alco Tool Company, Bridgeport, Connecticut, U. S. A.



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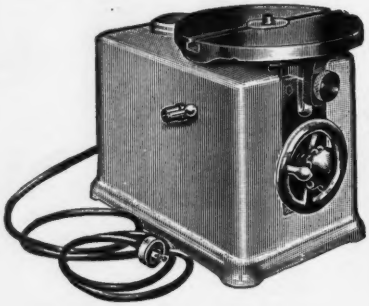

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Considering that the parts now being Superfinished include some cast iron, hardened steel, aluminum, and brake shoe linings, the parts come to the Superfinish machine in various states of surface smoothness. Super-

Close view of crankshaft with Superfinishing stones in operation. Note that the stones are held in holders which can quickly and easily be removed when necessary. These stones are changed once a day. The operation is facilitated by a flood of oil which is intended for lubrication rather than for cooling.

finish can also be applied to varying degrees as indicated in the following table:

Part	Before Superfinish	Micro-Inches	After Superfinish
Flywheel	Turned	80	5 Micro-in.
Piston	Ground	40	5 Micro-in.
Crankshaft	Ground	35	5 Micro-in.
Wrist Pin	Ground	20	2 Micro-in.
Valve Stem	Ground	15	3 Micro-in.
Tappet Heads	Ground	7	1 Micro-in.

In designing the machines with which the Superfinish operation is performed, it is intended that no single grit or point in the abrasive stone will repeat its path over the surface

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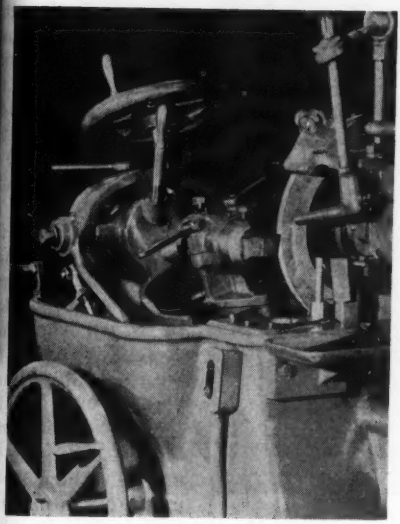

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of the work. The required balance between work speed and stone oscillation has been worked out along this line.

Considering the quality of finish as of first importance, the second important item is the speed with which this finish can be obtained. Repeated

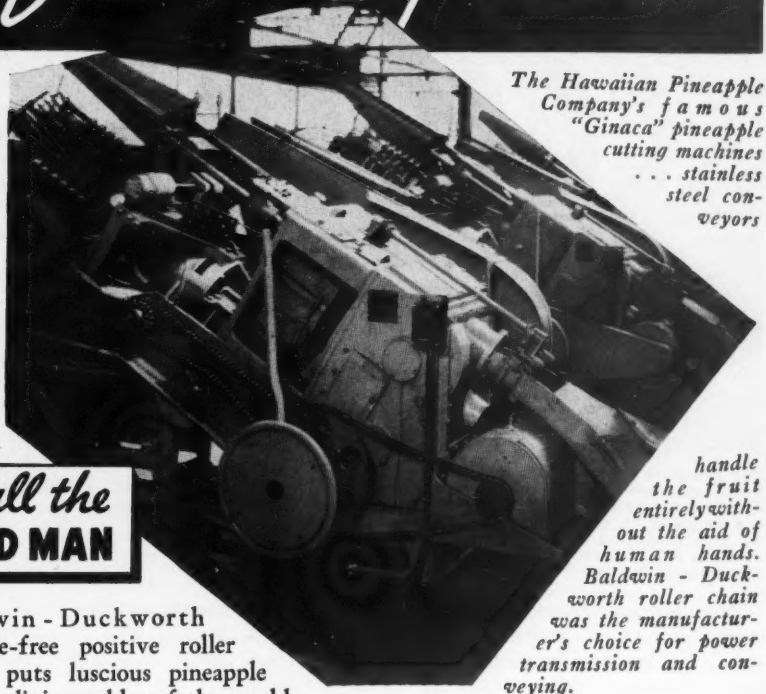
In this machine the camshaft bearings are Superfinished.

experiments indicate that the bulk of the high spots are removed in the first 10 seconds of operation and that there is little economy in continuing the operation beyond 30 seconds. It is assumed, of course, that the surface has previously been finished to comparative smoothness — which is easily attainable with modern production equipment. The stone grit must also be taken into consideration as having a bearing on the ultimate finish.

Records of the amount of wear on the abrasive stones used in the Super finishing machines at Chrysler Cor poration indicate that the operatio is economical. Pressure upon th stones is comparatively light; thu they continue to cut throughout th finishing of a great many pieces. Th contact point between the stones an the work is kept con tinually flooded with lubricant, which also ensures against ex cessive stone wear. On the operation of Superfinishing valve stems, more than 300,000 pieces have been finished with out replacing the stones. However, the valve stems are fin ished by the use of two large stone discs whereas all other parts are fin ished with small rectangular stones. Of the operations in which the small stones are used, up wards of 260 crank shafts can be fin ished without neces sity of changing the stones. Thus far the minimum number of camshaft bearings finished with one set of stones is 800; tappets, 8,000; brake drums, 9,800; and pistons, 1,650.

The brake drums which come to the Superfinisher have been machined with a 0.022 in. feed which produces a surface variation of 110 micro inches. The pistons have been pre viously rough ground to 35 micro inches. These pistons are Superfin ished to 6 micro-inches averag roughness, the cylinder bores being Superfinished to the same limit. It is interesting to note that the appli

Perfect Timing DOES IT



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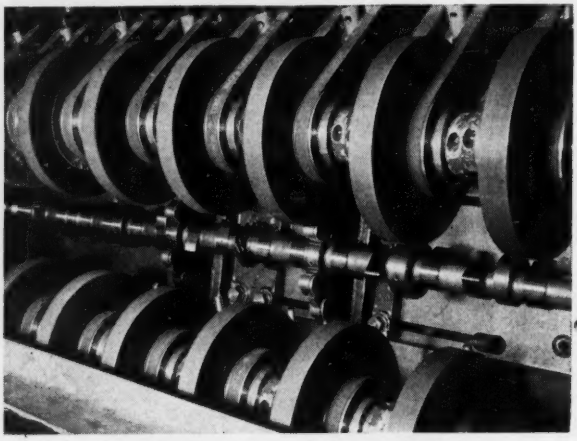
cation of Superfinish to the pistons and cylinder bores results in the surface comparable to that obtained by several thousand miles of careful running-in without, however, the danger of scuffing, scoring, or excessive wear during the initial period.



The cams are Superfinished in a machine designed to use Superfinishing stones in the shape of wheels which revolve at a speed of 800 r.p.m. while the camshaft revolves at the comparatively low speed of 22 r.p.m., at the same time oscillating lengthwise ⅛ inch at a rate of 230 times per minute. The direction of rotation of the shaft is reversed in the middle of the operation. Diameter of the stone is 5 times the base diameter of the cam.

To reduce friction and prevent heating with consequent scoring and wear of bearing surfaces, a film of oil — however thin — must be maintained between the surfaces at all times. Ordinarily the wall of a new cylinder—and the surface of the contacting piston—would be found under the microscope to consist of a series of more or less sharp ridges and valleys, and when the contacting parts are moving past each other at high rates of speed, the oil film is easily ruptured by these sharp points. The "running-in" process consists, of course, in wearing the surfaces of the contacting parts to such smoothness that the oil film will not be ruptured and thus the surfaces will have constant protection.

The machines in which the Superfinish operation is performed are designed so that the work can be placed in the machines and the operation completed with a minimum of movements. The machines are hydraulically operated and pressure is applied to the shaft carrying the Superfinish stones by the same means, although sometimes in combination with springs.

The cost of Superfinishing is exceedingly low, due to the high speed

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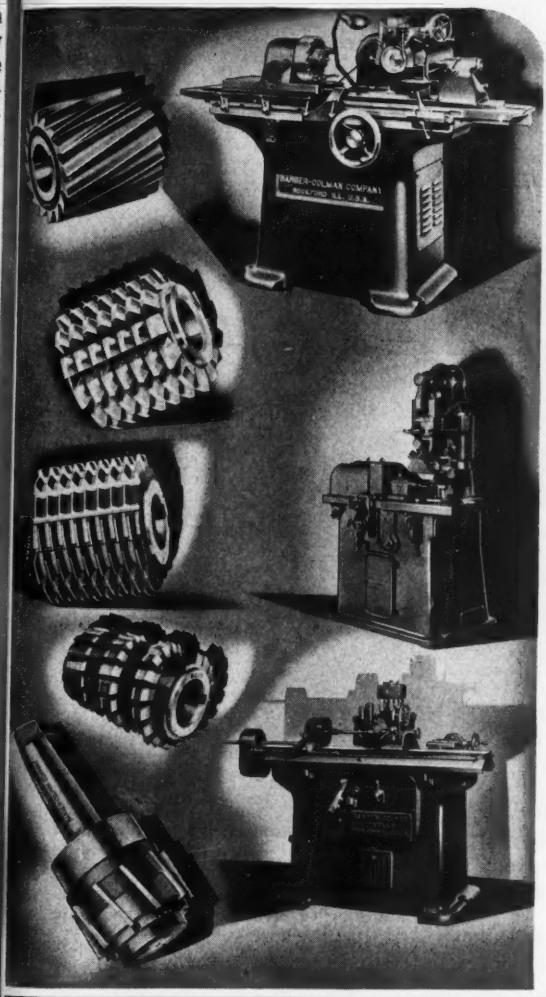

When you get right down to it the production, and the return on your investment, obtained from a machine tool depends largely on the cutters used, their quality and condition.

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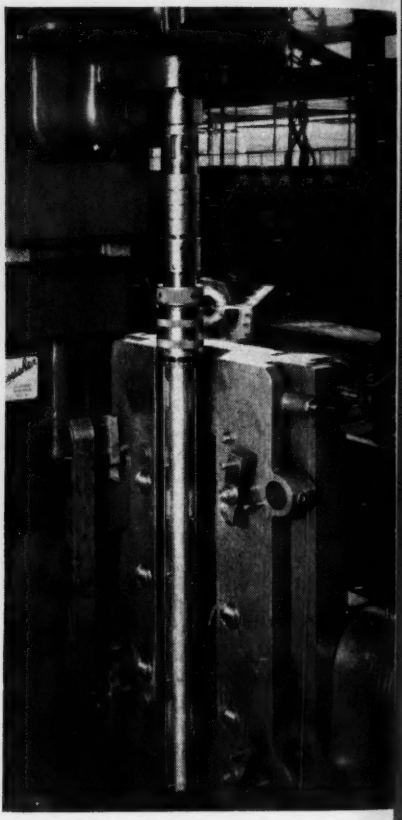
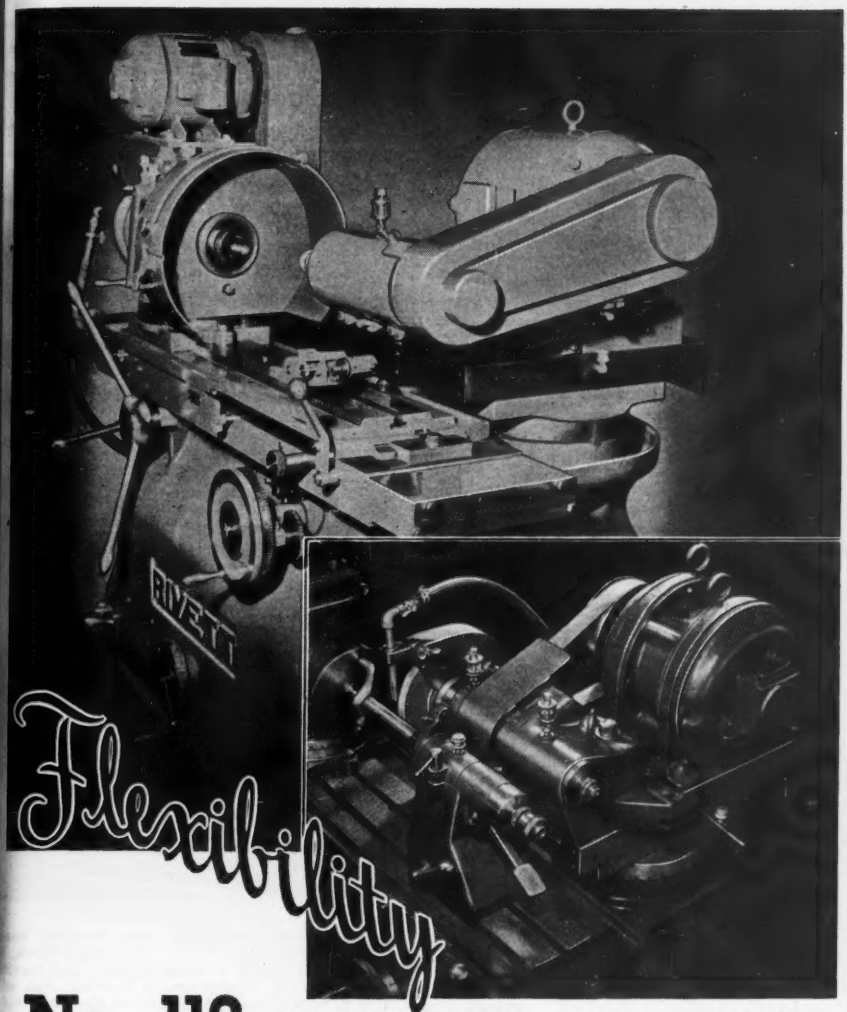
with which this operation can be performed. In the plants of the Chrysler Corporation the average time required on the Superfinishing of 10 different kinds of parts is only 17 seconds, and the longest time for any operation is



Close view of Superfinishing tool used to finish the crankshaft main bearing seats in the crankcase. This is an expansion tool, controlled by the knurled ring shown just above the upper end of the stone-holder.

40 seconds. In the latter case the main and pin bearings of a crankshaft were finished from a 35 micro-inch ground surface to 5 micro-inches. In ordinary production the surfaces produced do not vary more than one



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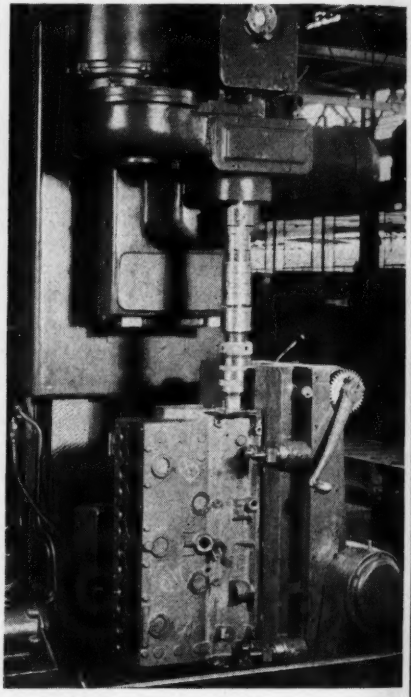
or two micro-inches and any number of parts can be produced with assurance that every part will come within the required limits of smoothness.

The amount of time required for changing stones is only a few minutes a day, abrasive sticks being set into holders especially designed for quick clamping in the machines. No stone dressing is required.



Superfinishing crankshaft main bearing bores in the Chrysler crankcase. The Superfinish, in this case, produces a static bearing seat having a much larger percentage of bearing area and thus a better back-up action on the thin steel shell babbitt bearing. With so nearly 100 per cent contact of the bearing shell with the cast iron seat, the greater contact area aids in carrying off heat and bearing temperatures are reduced.

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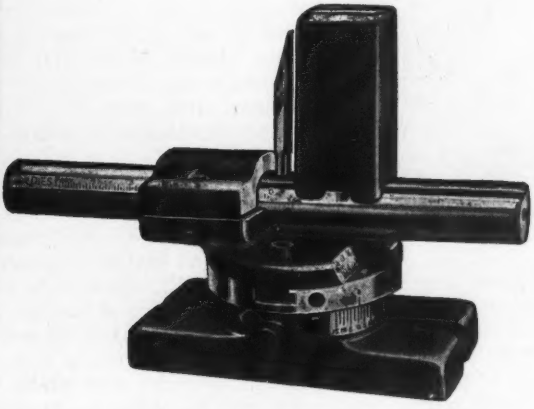

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Maintenance Operations on Turret Lathes

By W. K. Bailey
Service Manager, The Warner & Swasey Company, Cleveland, Ohio

THERE are still in use throughout the United States more than 38,000 turret lathes that are 10 years old or older.

It is clearly evident from the flood of mail coming to the desks of machine tool builders' service managers that most of these 10 to 25-year-old machines are failing to produce work of the desired accuracy. This does not mean, however, that all these machines are hopelessly worn out and incapable of ever again accurately and efficiently cutting metal. All or part of the original accuracy of many of these old turret lathes could, with proper reconditioning, be re-established and the present production of the machines materially increased.

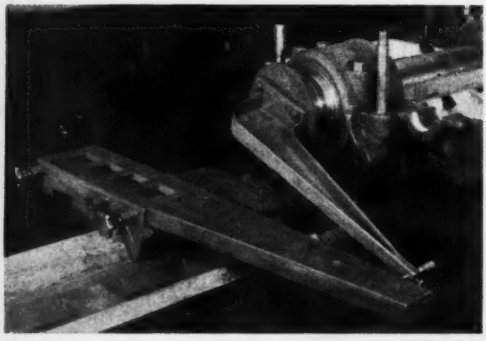


Fig. 1—Fixture for Aligning Cross Slide Carriage with Spindle

In the belief that the average owner would be interested in determining to what extent his old machine could be reconditioned in his own shop, this diagnosis of major turret lathe troubles is presented, together with an outline of the procedure to be followed in repairing them.

It must be pointed out, however, that the reconditioned machine will never be equivalent to a present model turret lathe. The speed, power and accuracy of a reconditioned machine will always be limited by its original design.

Re-establishing original performance in a machine tool that has seen many years of service means, of course, a thorough repairing and reconditioning based on sound engineering analysis. Hasty, superficial, haphazard fix-ups do not solve the problem, since they do not get to the fundamental source of trouble.

The **complete** reconditioning or rebuilding of a turret lathe needed to restore its original accuracy and ability to produce, requires the skill, experience and equipment of the original builder and should be done in his plant. However, much can be done effectively and efficiently in the owner's own plant and the work can be done by the first class mechanics and tools available in first class repair departments.

Classification of Repairs

Repairs required on turret lathes due to normal wear, over a period of years, are of two classes:

mechanical repairs required to keep a machine in operation, and the more difficult repairs required to re-establish accuracy.

We will not be concerned here with mechanical repairs. Adjustment of slipping clutches, replacement of worn gears or shafts, or the correction of troubles that may develop in a machine suddenly as the result of the failure of some part, are readily handled by mechanics and repair men in the course of their normal days' work. We will rather be concerned with those problems that develop in a machine slowly over a long period of time as the result of constant wear.

Such problems and the procedure for correcting them are basically the same for every old turret lathe regardless of make. The procedure for reconditioning them may, however, vary in detail. When the directions must necessarily be specific and detailed I can best proceed with these particular points by considering the Warner & Swasey machine—the machine with which I am most familiar.

Trouble that may likely develop in an old turret lathe as a result of long wear can be tabulated in six major categories, outlined here in question form.

1. Will the machine duplicate sizes?
2. Does the machine produce chatter?
3. Do the finished surfaces show gear tooth marks?
4. Does the cross slide face and cut off square?
5. Do reamers and counterbores cut properly?
6. Does the machine cut taper with tools held in the hexagon turret?

Although the solution to some of these problems, to repeat, may require factory skill and experience, most of them can be readily solved by good repairmen right in your shop. Most manufacturers can supply you with any repair parts needed to com-

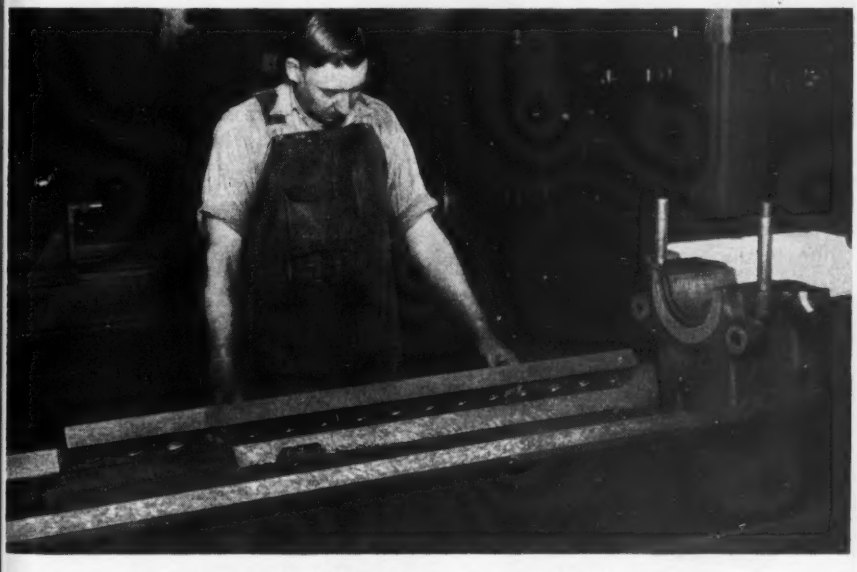


Fig. 2—Straight-Edge Used in Re-Scraping Turret Lathe Bed

plete the job; and their service representatives are at all times equipped to lend reliable advice and instruction.

1. Will the Machine Duplicate Sizes? In other words, at one setting of the machine will it cut the same diameter on successive pieces or does the size of cut vary? The failure of a machine to duplicate size on successive pieces indicates quite definitely that there is trouble in the lockbolt mechanism of either the hexagon or the square turret, depending on where the trouble develops.

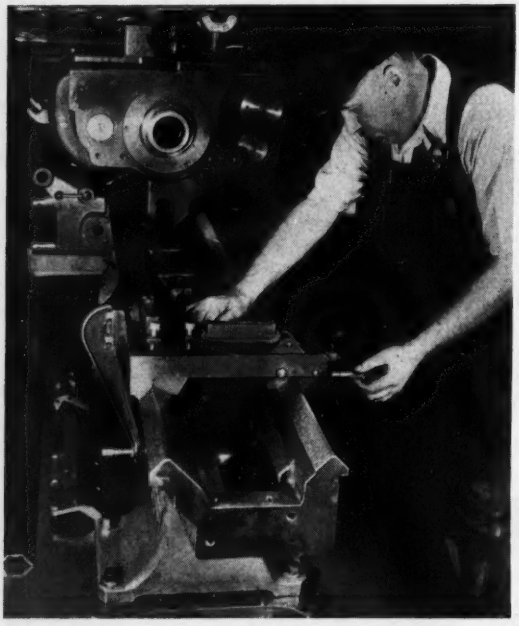
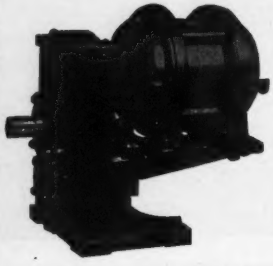


Fig. 3—Fixture Used for Aligning Turret Lathe Bed

In either case the finding of the trouble and the procedure for its elimination is generally the same, as follows: Remove the turret causing the trouble and inspect, (a) the strength of the lockbolt spring, (b) the condition of the tapered end of the lockbolt, (c) the fit of the lockbolt in its sleeve, (d) the condition of the lockbolt bushings, and (e) the fit of the center pilot about which the turret revolves.

A pressure of at least 25 pounds should be required to compress the lockbolt spring of small ram-type machines. This minimum may be as high as 150 pounds on the larger saddle-type machines. There is no important part in the turret lathe that costs less than this spring, yet many cases of failure to duplicate size can be corrected by the installation of a new spring which will force the tapered end of the lockbolt to a proper seat in the lockbolt bushings.

If the end of the lockbolt is so



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worn or damaged that it does not present a smooth, tapered surface, or if the lockbolt shows any appreciable play in its sleeve, it should be replaced.

The new lockbolt must be very carefully fitted in the sleeve. This work is usually done with a cast iron or brass lap driven by a slow-speed electric motor and with a fine grade of emery as the lapping compound. The usual procedure is to suspend the electric motor from overhead by means of a large coil spring, so that while the motor is driving the lap, both motor and lap can be moved up and down.

The lockbolt bushings which are pressed into the bottom of the turret should present a smooth tapered hole for the lockbolt. If these bushings are not in good condition, they should be replaced. It is good practice to install new lockbolt bushings whenever a new lockbolt has been installed.

After the lockbolt, spring, and bushing have been inspected and any necessary repairs or replacements have been made, the turret should be re-installed. The bottom of the turret and the bearing surface on the slide, or on the saddle, should be rescraped until a good bearing is indicated. Care should be taken that the center pilot about which the turret revolves is in good condition, and that there is no more play in this unit than is necessary to allow the turret to revolve freely.

After a good complete repair job has been made, the turret should repeat its index in either direction within plus or minus 0.0005 in. as measured at the turret face.

2. Does the Machine Produce Chatter? Chatter is caused by vibration, and usually results from loose bearings at some point. It should be distinguished from gear tooth marks, which are discussed in question 3.

If a tool on the rear of the cross slide chatters, it indicates looseness of the cross slide bearing, but if a tool on the front of the cross slide chatters, looseness of the spindle bearing is indicated. Chatter developed from cutters in the hexagon turret may indicate loose spindle bearings or, under heavy cuts, loose turret slide bearings. In this connection it should be remembered that a tool placed below center or ground without the proper top rake is apt to produce chatter in any machine at any time.

Elimination of wear on cross slide bearings by adjusting the gib is not discussed here in detail because all good repair men are well experienced in tightening bearings. It should be remembered, however, that if wear is sufficient to require new tapered gibs to be fitted, it is often necessary to rescrape the complete unit. Usually the wear is not uniform at all points but is greater in the position where the slide has been used the most.

Rescraping of the complete cross slide unit should not be attempted unless repair men are available who have had experience in this line of work. The brief discussion under question 4 will indicate the care that must be taken with this job. New tapered gibs should be longer than standard and cut to proper length only after they have been properly fitted over the entire length of the bearing. New gibs furnished for replacement purposes are ordinarily long enough to compensate for wear when fitted to old machines.

Loose spindle bearings—that is, of course, plain type bearings and not roller or ball bearings—can be tightened by removing the top bearing cap and filing the surface that bolts to the head. After the bearing has been brought down tight against the spindle, the bearing surface should be very carefully scraped to insure long life and prevent possible overheating.

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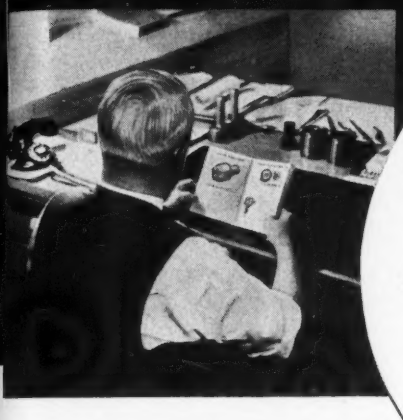

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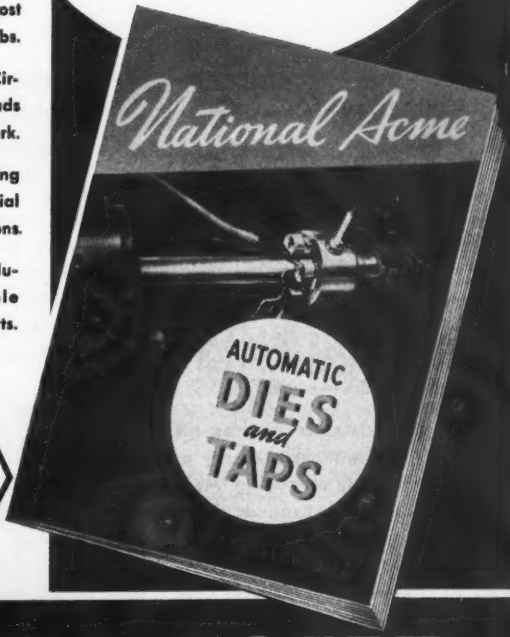

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If side play is also found in the bearing, the bottom half should first be scraped until the spindle drops to a point where the bearing is obtained on the side as well as on the bottom. Then the same procedure should be followed with the top half of the bearing. Care must be taken not to throw the spindle out of alignment with the turret holes.

To eliminate chatter from the hexagon turret, usually the result of loose bearings, all gibs should be refitted and adjusted or new gibs installed.

3. Do the Finished Surfaces Show Gear Tooth Marks? These marks, which are often mistakenly called chatter marks, can be distinguished from chatter by the fact that on different diameters cut at the same speed the same number of marks will be produced. The actual depth of the gear tooth mark is usually very slight but may at times be sufficient to prevent the obtaining of a satisfactory finish.

This trouble is always caused by the improper meshing of the gear teeth at some point in the train of gears in the head of the machine, and is usually the result of wear on the gear teeth. The gears responsible are usually those that actually drive the spindle and the number of marks on the work will always correspond with the number of teeth in either the driving or driven gears that is causing the trouble. Loose spindle bearings will make this condition worse, but tightening the spindle bearings will not permanently correct the trouble.

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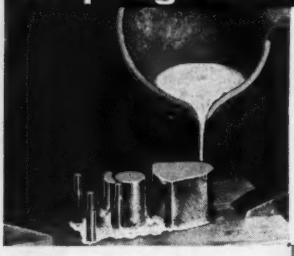

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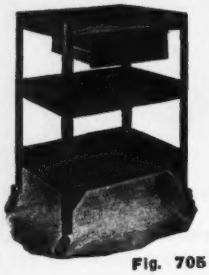

Fig. 705

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and-error method. Very often this trouble becomes apparent when one new gear has been installed and is meshed with an old gear. For this reason it is always advisable to replace mating gears in the all-geared heads of turret lathes.

4. Does the Cross Slide Face and Cut Off Square? That is; does a facing cutter held on the cross slide produce a flat surface? If it does not, you have a definite indication that the cross slide is not traveling at right angles to the spindle. The cause may be either wear in the cross slide bearings or wear in the spindle bearings.

Refitting cross slide bearings so worn that the cross slide is out of square requires a more careful procedure than that outlined in question 2. To merely install a new gib will not, of course, eliminate the trouble. On saddle or "A" type machines the problem now is to first refit or scrape the side of the cross slide carriage bearing which is away from the gib so that it is straight and at right angles to the spindle. The method used at the factory for checking this is illustrated in Figure 1.

In plants where this job is done only occasionally, equipment similar to that shown in the illustration can be readily made up. A long straight piece of round stock may be laid in the dovetail of the carriage and an indicator may be clamped to a bent bar held in the spindle chuck. Indicator readings at the front and the rear of the carriage dovetail should be within 0.001 inch.

After the rear-spindle side has been squared, the other side of the dovetail must be paralleled to it. The cross slide is then scraped to fit the carriage and the tapered gib must be refitted or a new gib installed.

On flat bed or ram-type machines the dovetail itself need not be squared with the spindle. If necessary, the car-

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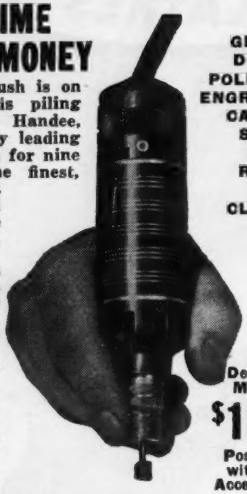

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riage and cross slide bearing surfaces and dovetails may be scraped to re-establish good bearing and straightness, and a new taper gib installed, but the actual squaring of the cross slide with the spindle is usually best done by scraping the carriage where it heels against the bed on the side opposite the adjusting screws or gib.

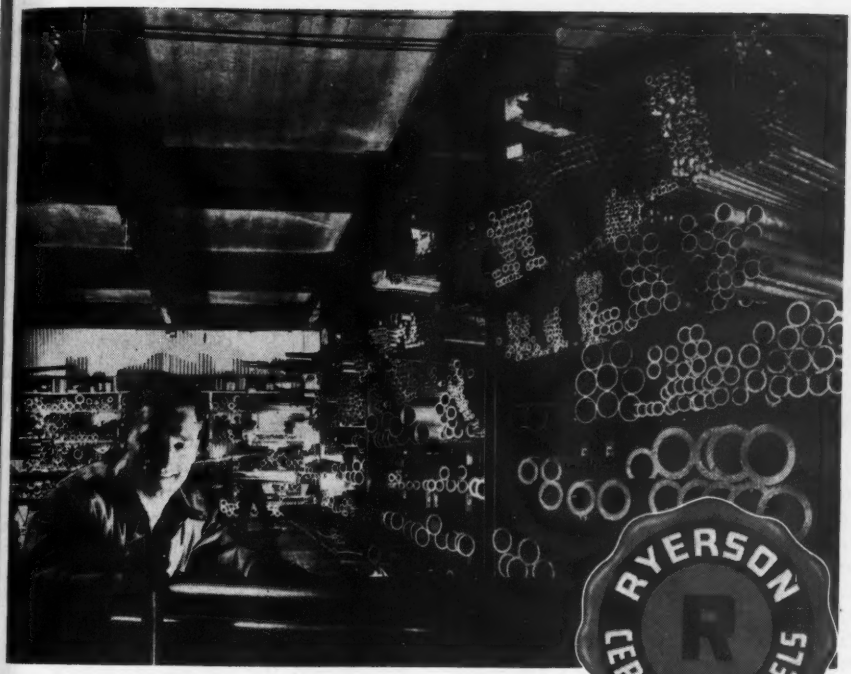
When the out-of-square condition of a cross slide which produces a cone-shaped surface is the result of side wear of the spindle bearing, the spindle should be re-aligned with the bed. This is not frequently encountered. Procedure for its elimination will be outlined in question 6.

5. Do Reamers and Counterbores Cut Properly? If reamers and counterbores cut oversize but straight, the tools are not held on the center-line of the spindle. In this case the turret hole or the shank of the tool should be repaired so that the reamer or counterbore is exactly on center.

If the reamers cut tapered holes, you have a definite indication that they are not held parallel with the spindle and that they enter the hole at an angle. The cause may be in the tool holder, the turret hole or turret face, a worn condition of the bed, or a worn spindle bearing. The trouble can usually be corrected, however, by repairing the tool holder or the turret hole or by providing sufficient float for the reamer.

The most practical method of repairing flanged type tool holders is to mount the holder on a straight arbor, tighten the tool-holding screws, place the arbor in the lathe and take a finishing cut on the back face of the tool holder. This will give a face on the back of the holder which is square with the tool hole, and drills and reamers will be parallel with the spindle provided the turret face itself is square with the spindle.

Another method sometimes used and recommended when the turret



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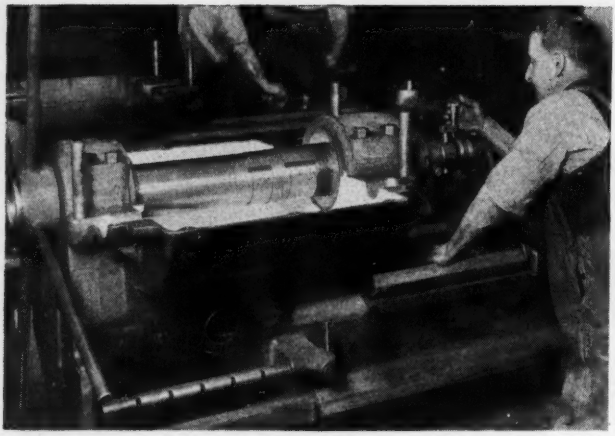

Fig. 4—Checking a Reconditioned Machine to Make Sure that Spindle Lies Parallel with Bed

tool holes are in bad condition is to bore the holes oversize, install a bushing and rebore to standard size. Bushings can be purchased at the factory and the boring can be done on the turret lathe by using a boring bar in the chuck, as shown in Figure 5. The fixture used at the factory for refacing turrets is shown in Figure 6.

Shank-type tools that have become bent or worn can usually be readily repaired. On machines that have seen a great deal of use, however, the turret holes themselves are apt to be below center due to wear on the bed, wear on the turret saddle or slide, or wear on the turret and turret seat.

This condition can usually be improved by boring the turret holes oversize, installing bushings, which can be furnished from the factory for this purpose, and reboring to a standard size. This reboring operation is, of course, accomplished on the machine itself by using a boring bar in the chuck or in the collet. Before the reboring operation the lockbolt or indexing mechanism should be checked as outlined under question 1.

It should be noted, however, that while this reboring operation re-establishes alignment of the turret hole with the spindle at the point on the bed where the turret is rebored, it does not correct for the down-hill travel experienced on old machines and caused by uneven bed or spindle wear. (The method of correcting for uneven wear on the bed and re-alignment of the spindle will be discussed

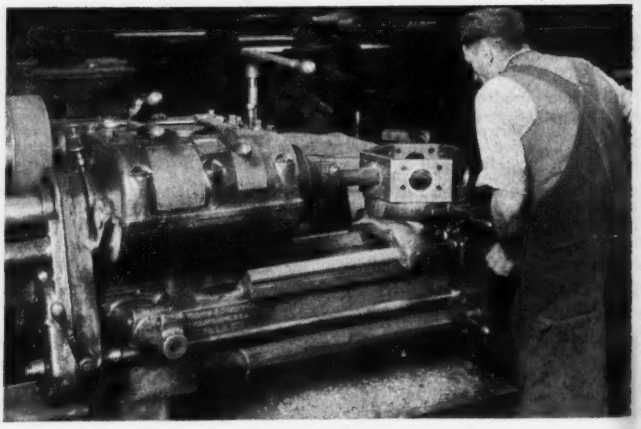

Fig. 5—Reboring Turret Holes on Reconditioned Machine

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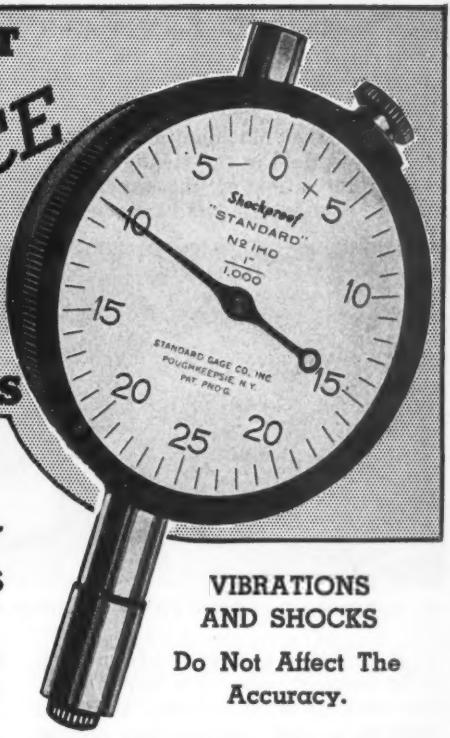

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in question 6.) However, many machines are made to produce in a much more satisfactory manner by re-establishing the turret holes to center by reboring and bushing them.

6. Does the Machine Cut Taper With Tools Held in the Hexagon Turret? Elimination of the taper cutting of tools held in the hexagon turret is probably the most difficult job in the reconditioning of a turret lathe. The work involved requires skill and experience. The reason for cutting taper, together with the plan for correcting the difficulty, should therefore be very carefully predetermined.

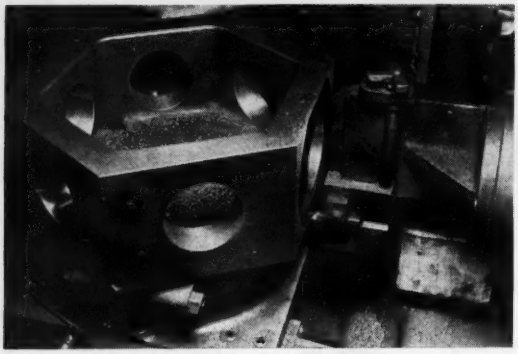
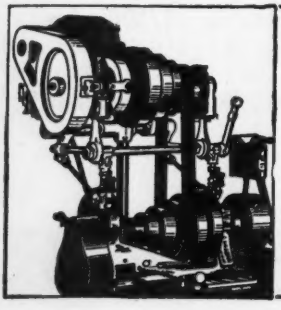


Fig. 6—Refacing Turret with Fixture Mounted in Spindle

A machine should not be condemned of cutting taper, however, until it has been carefully leveled and a test boring-cut made with a cutter held in an unpiloted bar. All turret lathes (except under conditions discussed below) must be leveled to remove twist in the bed, if accurate work is to be produced. An unpiloted bar must be used because even a perfect machine will bore taper with a piloted boring bar if the bar is not straight or if it is held in an inaccurate tool holder.

If under these tests conditions a taper bore is produced, you have definitely established that the turret does not travel parallel with the axis of the spindle. On saddle or "A" type machines, this condition is the result of wear on either the bed or the spindle bearings, or both. On ram-type machines the cause may be wear on the turret saddle, the turret slide, the spindle bearings, or all three.

With either type of machine the elimination of wear by re-establishing parallel bearing surfaces is a major operation, as will be seen below. It is therefore often practical on old machines to overcome the amount of this wear by deliberately putting a twist in the bed in such a direction as to compensate for all or part of the inaccuracy. Beyond this, it should be remembered that a change in cutter position will often greatly reduce the amount of taper produced.



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Neither change of cutter position nor the deliberate twisting of the bed will restore perfect operation of the machine, but such changes and adjustments often make it possible to continue an old machine in service without costly repairs. If your machine is so worn that required accuracies cannot be produced in this way, it is necessary to rescrape the bearing surfaces.

In order to show the magnitude of the problem of reconditioning these bearing surfaces, a brief outline of the recommended operations follows. This procedure is for saddle or "A" type machines with plain spindle bearings only.

1. Rescrape bed bearings.
   a. Remove cross slide and hex turret units and eliminate any twist in bed by supporting right hand end of bed as shown in Figure 7.
   b. Scrape inside of front "V" to a straight edge, see Fig. 2.
   c. Scrape outside of front "V" straight and parallel to inside of front "V", using straight edge and an adjustable level mounted longitudinally on a fixture similar to that shown in Fig. 3.
   d. Scrape rear "V" straight and parallel to front "V" using straight edge, level and indicator in an adjustable block, as in Fig. 3.
   e. Scrape apron pad in front of bed straight and parallel to the front way.
2. Scrape the saddle bearing surfaces to the bed, using the bed as a surface plate.
3. Rescrape the spindle bearings.
   a. Remove head cover and top caps from spindle bearings.
   b. Check to determine the angle at which spindle lies in relation to the refitted bed bearing. Mount a plug in one turret hole and a simple fixture, such as illustrated in Fig. 4, in the spindle. Move turret close to spindle and take readings 180 deg. apart in the horizontal plane. Move the turret 12 in. back and compare similar readings. Repeat this procedure in the vertical plane.
   c. Scrape the bearings, after carefully determining from the above check where the metal must be removed to bring the spindle parallel with the bed.
   d. Continue the procedure until the micrometer readings compare within 0.001 in., and then scrape for good bearing surfaces.
   e. Fit the top caps until the bearings are tight and good bearing surfaces are obtained.
4. Install the cross slide unit.
   a. Place machine on its four legs and carefully level to remove twist.
   b. Scrape the cross slide carriage to the bed.
   c. Scrape the cross slide bearing so that cross slide travels at right angles to the spindle (See Ques. 4).
5. Bore turret holes oversize, install bushings, and rebore to a standard size using a boring bar in the spindle chuck. See Fig. 5.
6. Reface turret with a fixture mounted in the spindle. If your machine is a Warner & Swasey, you may borrow the fixture (Fig. 6) used at the factory.

On ram or flat bed machines where the turret is mounted on a slide in the saddle instead of directly on the bed, the procedure for reconditioning bearings is somewhat different and usually simpler. Ordinarily the

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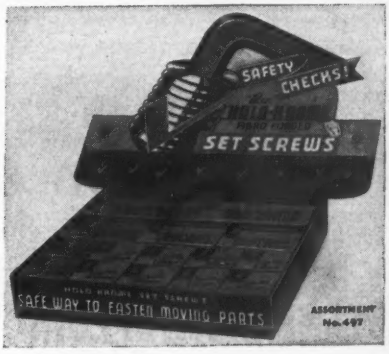

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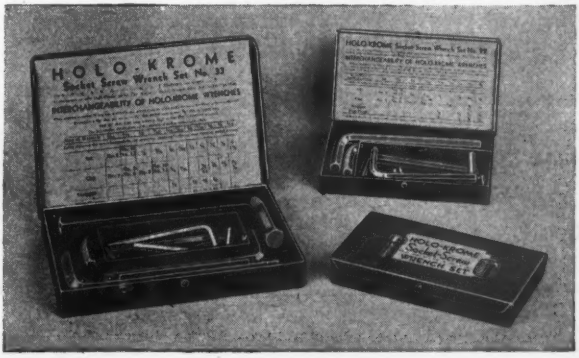

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bed bearings will not be worn enough to require rescraping, and the following procedure may be followed:

1. Level the machine.
2. Refit the turret slide to a good bearing in the saddle. Install and fit new gibs if necessary, and refit the top caps.
3. Rescrape the bottom of the saddle until the slide moves parallel with the bed, in both horizontal and vertical direction.

   This may be checked by clamping an indicator to the slide and comparing the distance, from the slide to the bed when the slide overhangs the saddle by different amounts.
4. Re-align the spindle bearings and rebore and reface the hexagon turret, using the same procedure as outlined above for "A"-type machines.

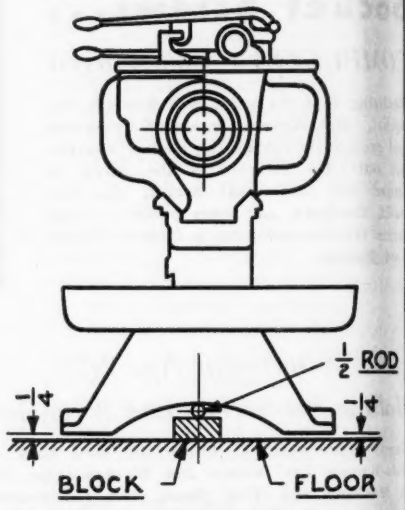

Fig. 7—Drawing Illustrating Manner of Supporting End of Bed to Eliminate Twist while Rescraping Bed Bearings

Before attempting any reconditioning of bearing surfaces, on either type machine, it is advisable to first make all necessary repairs to the

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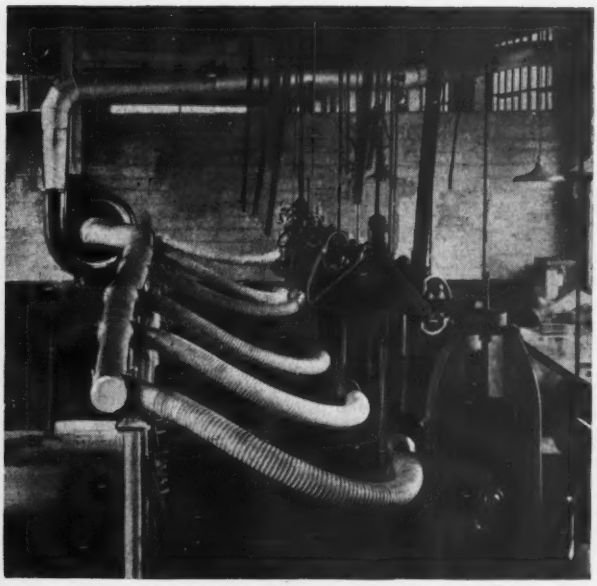

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lockbolt mechanism (See Question 1). This will guard against changing the bearing surface in driving the old lockbolt sleeve out or in driving the new one in. It will also leave the reboring and refacing of the turret to be done only after all other repairs have been made.

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Pratt & Whitney Small Tools Catalog No. 15. This book, now being distributed by Pratt & Whitney Division, Niles-Bement-Pond Company, Hartford, Conn., is bound in imitation leather and contains 46 pages devoted to the line of small tools made by this company. The book is divided into 11 sections devoted in turn to taps, dies, screw plates, cutters, cutters for P & W machines, reamers, punches, drills, miscellaneous tools, useful tables and the index. In each section a complete range of tools is presented together with illustrations, descriptions, tables of specifications and prices.

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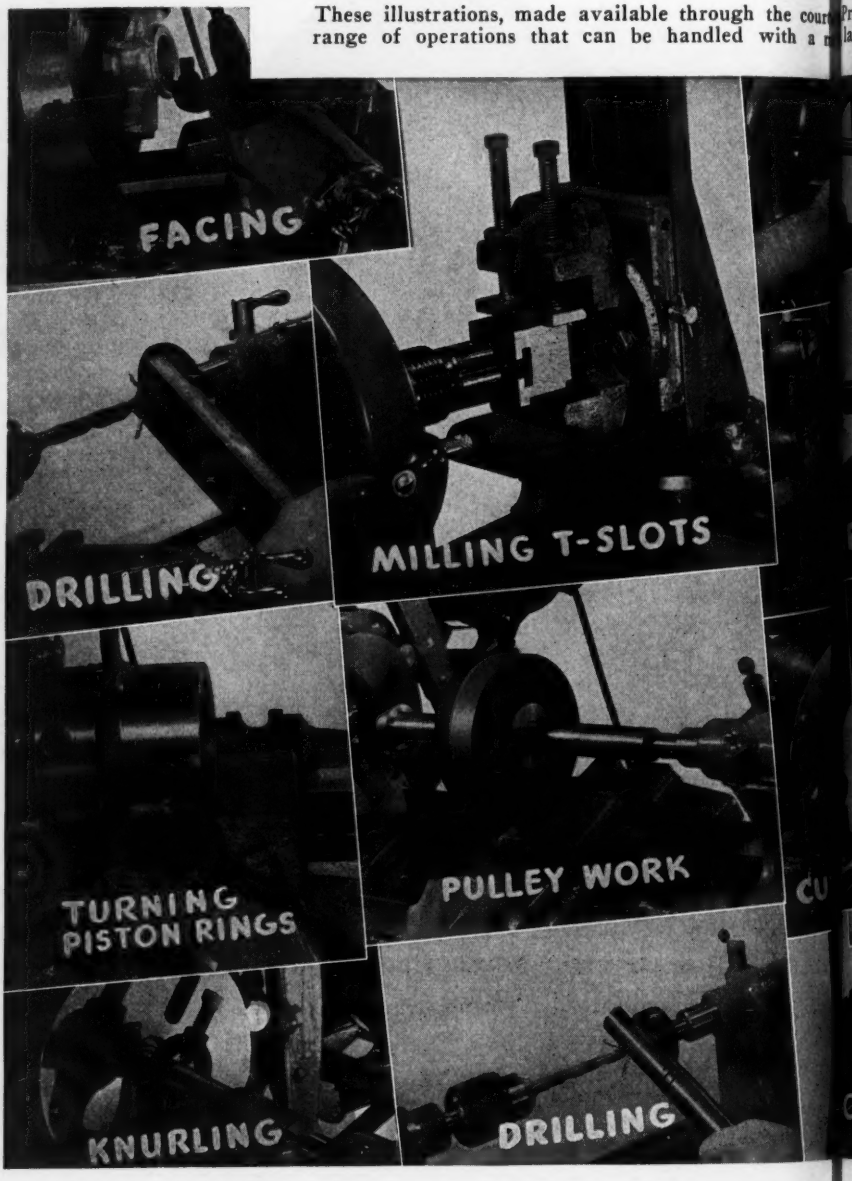

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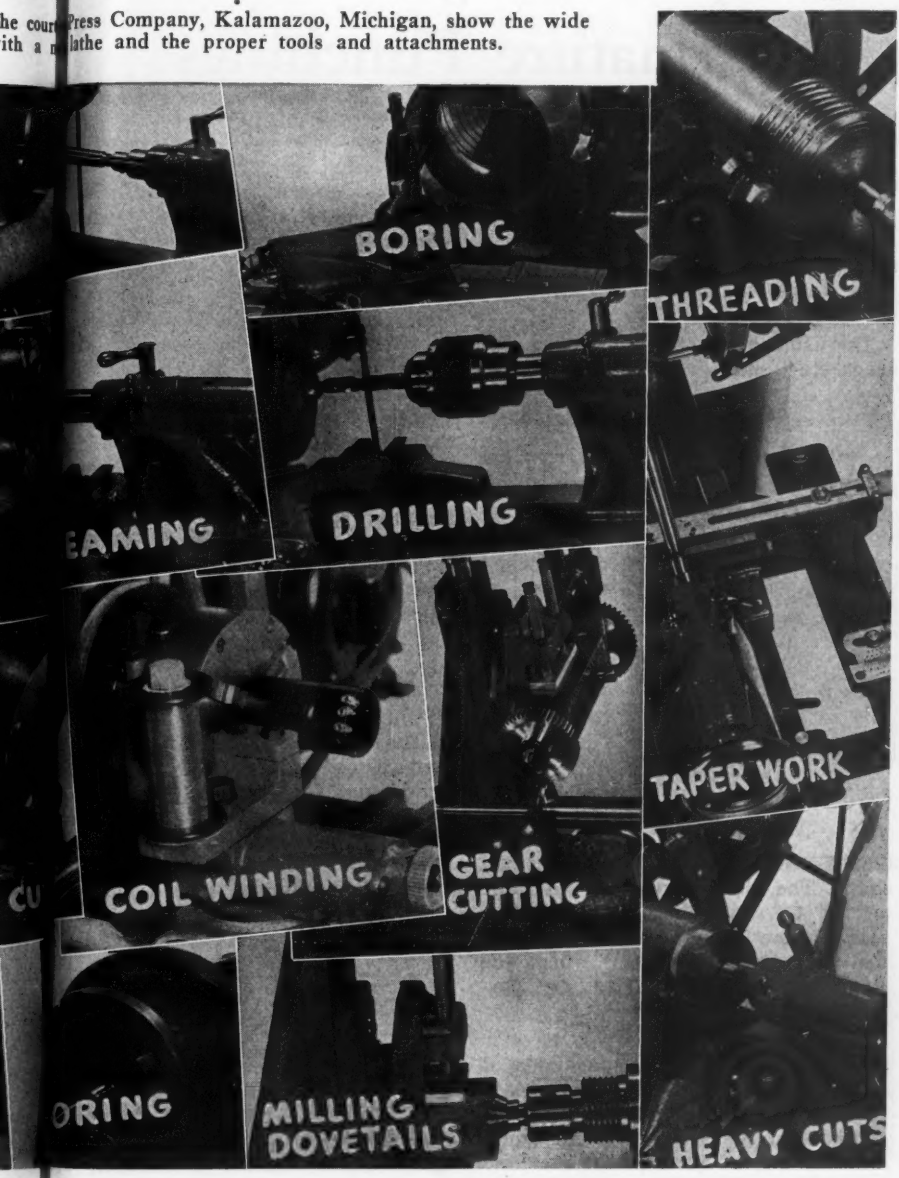

Compound Segment Die for Armature Punchings

By C. L. Szalanczy
Tools and Equipment Department, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

IN this article the construction of a compound type segment blanking die is illustrated and discussed. This type of a die will produce a complete large lamination punching in one operation.

The usual procedure is to shear the sheet steel material from which the

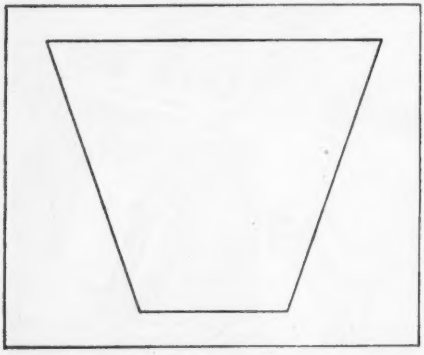

Fig. 1—Drawing Showing Keystone Shape of Blank Material

blanks are to be made to a keystone shape. The blanks are then piled one on top of another on a steel plate skid or carrier and the carriers are moved to the punch press where the blanking operation is to be performed.

The punch press used for the production of these large type blanks is inclined on an angle of 45 degrees to facilitate the removal of both the blanks and the scrap, both of which pass out at the rear of the machine.

Fig. 1 shows the keystone shaped piece of material as sheared from the sheet, and Fig. 2 shows the completed blank as made by the compound die.

The drawing Fig. 3 shows the design of the punch or lower part of the die. Item 1, which is the bottom plate, is made of hot rolled steel plate burned out to the required dimensions. The top and bottom surfaces are finish machined and a groove and opening is machined on the bottom for allowing the stop assembly to be set in.

The bottom shoe, item 2, is also of hot rolled steel plate, burned out to the same dimensions as the bottom plate. Item 2 is finished on the bottom surface only. On the top, the shoe is machined out ⅛ in. deep and to the contour of the punch pieces, marked items 3 and 4.

The bottom shoe item 2 is drilled and reamed to take four suitable-size guide pins for aligning the lower die part with the upper. The bottom plate is drilled out directly under these guide pins so that if their removal is necessary, it can easily be done by driving a pin through these holes. The shoe is fastened to the lower plate with a number of hex head tap bolts, and is kept from shifting out of line by two No. 5 taper pins. The two plates are drilled through and tapped at four places to accommodate eye-bolts for lifting purposes.

The punch pieces items 3 are of good grade cutting tool steel, ma-

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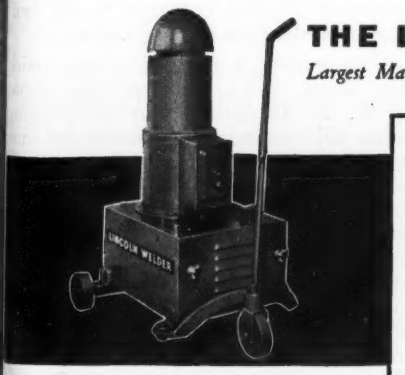

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chined to size. The punch, for several reasons, is made in two pieces. One is that the pieces can usually be shaped from bar stock. Otherwise a special piece of tool steel would have to be ordered, which would not only increase the tool cost but would also cause unnecessary delay in construction. Another reason is that when a large punch is made in this manner, the tool maker has an easier

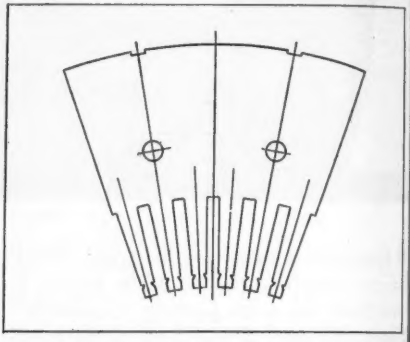

Fig. 2—Segmental Stamping Produced by the Compound Die

task of getting the dovetails and holes properly located. The two surfaces that join on the center line of the punch are ground till they are exactly in the correct position and match the template. One of the punch pieces is slightly undercut in the center to make the fitting easier.

The punch is beveled down inside for about ¾ in., leaving only about $\frac{1}{16}$ in. flat for backing up the cutting edge all around. The punch is then machined down far enough so a separate filler piece item 5 may be set in. This filler piece can be burned out of a plate of hot rolled steel. The punch pieces are fastened to the shoe with hex head bolts and located into positions with several dowels. Holes are drilled through to allow passage for the hex head bolts that hold the filler piece in place.

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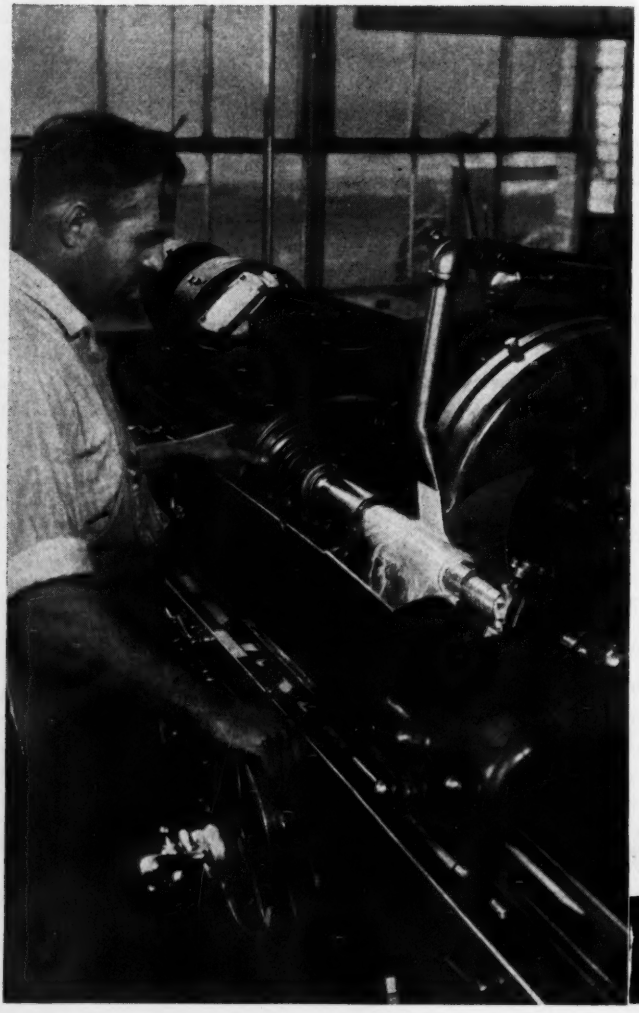

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The die part for the two large holes are machined directly in position on the punches. They conform in design to the outer side of the punch, are tapered downward to the same depth and with the $\frac{1}{16}$ in. flat at the top. The filler piece is bored out to allow these extended die parts to punches may be filled to the height of the filler pieces with matrix alloy as shown in the photograph Fig. 4. This alloy can be poured in place when in the molten stage without affecting the hardness of the tool, and can easily be removed either by heating or chipping out when the punch

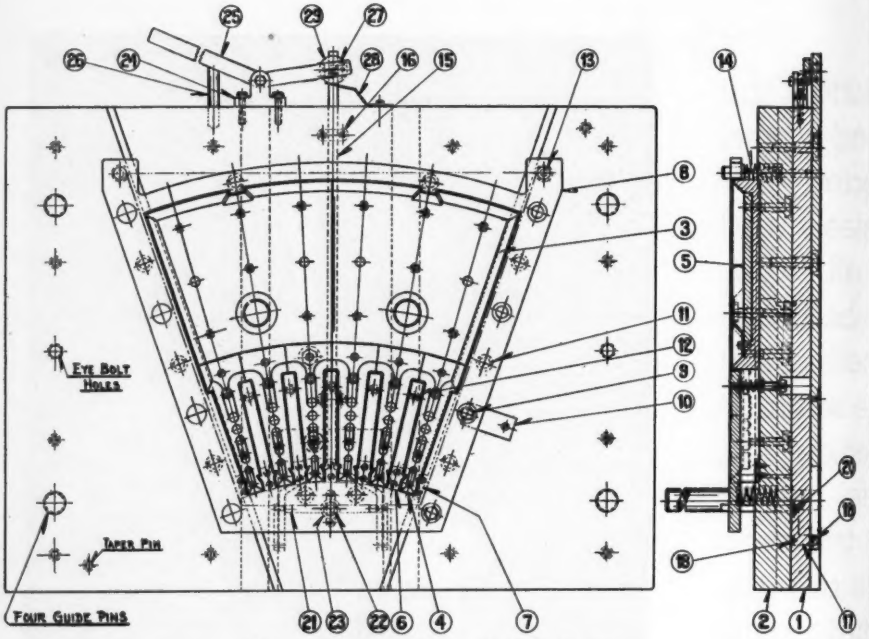

Fig. 3—Punch or Bottom Part of the Die

pass through it. The punch is finished to size and is then hardened to 40-43 Rockwell "C", which is a medium hardness and which develops the minimum distortion and hardening risks.

The punch pieces items 4 are made from the same grade of tool steel as the other two punches. These also are finished to size and are then hardened in the same manner. They are then drilled out with several different size drills and tapered and chipped out to the same depth as the other punch pieces. The opening in these is worn too short to be of further use. The reason for working the punches out in the first place is to provide for maximum die life and to eliminate the difficult machining which would have to be done when the punch is worn down to the point where the taper could not be maintained. The punch pieces are ground on the two sides where they join each other to assure accurate fitting. This is necessary, otherwise when checking the blanks at inspection by the turnover method, they would not line up

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with each other. The punches are machined flat on the wide end, leaving only tips to be carefully fitted to the large punch part. These punches are fastened to the lower shoe with two hex head bolts and two dowels.

The outer ends of the punches items 4 are set and aligned with the aid of the ¼-in. cold rolled steel

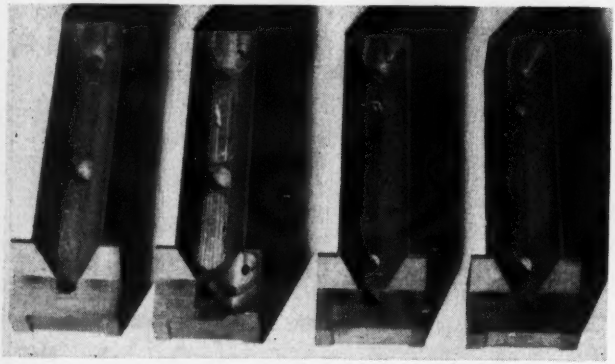

Fig. 4—Punches Filled with Matrix Alloy

spacers items 6 and 7. These spacers are made to the same size as the space between the punches, and are fastened to the shoe with two small flat head screws. The stripper item 8 is burned out of hot rolled steel plate to the shape shown in the illustration, and is then machined on the inside to slip-fit around the punches. The side walls must be made wide enough to assure sufficient strength to the stripper through the section where it is drilled and counterbored for the special stripper screws marked item 9. These screws are made with a square part milled on the body which is used for adjusting purposes. With the aid of these screws the stripper is set accurately so it passes the punch by 1/32 in. when the die is in open position.

The adjustment of the stripper is made with a special wrench, one provided for each screw. The wrench item 10, also acts as a lock when the tool is completed and is in operation. The wrench is fastened to the shoe with one small fillister head screw. The stripper screw is kept from coming out by a square nut that is sawed partly through and is then bent in a vise. When it is attached the nut locks itself by spreading apart.

The required number of compression springs, items 11, are placed around the punch, being set into counterbored holes in both the stripper and the lower shoe. These springs keep an even tension on the stripper at all times and prevent binding on the punches. A somewhat smaller

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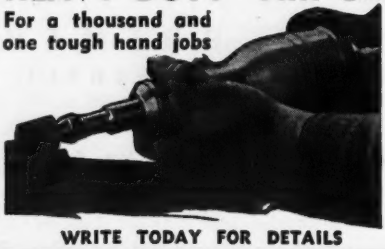

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compression spring, item 12, is placed under each of the five extensions or arms of the stripper that work in between the punch pieces items 4, to insure that they will function properly.

The two disappearing pins items 13 are used to locate the keystone-shaped blank material in correct

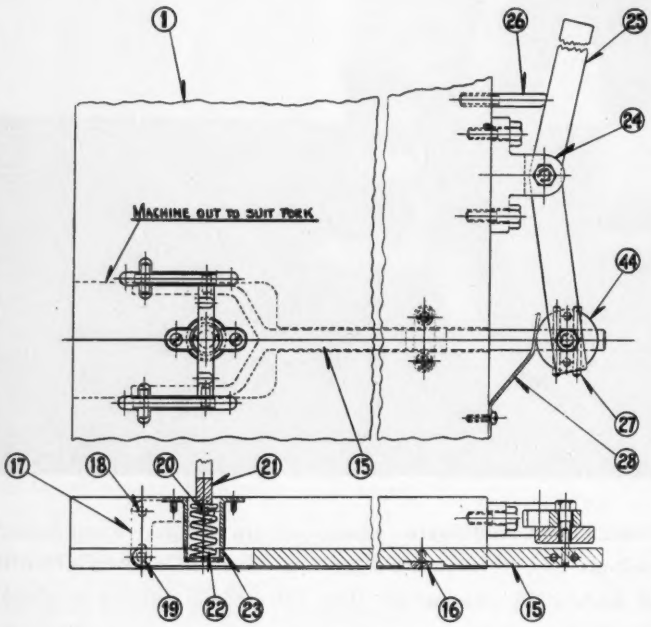

Fig. 5—Illustration Showing Bottom Plate with Stop Assembly in Place

punching position on the stripper. The pins are of drill rod and each has a shoulder that keeps it from coming out of the stripper. The lower end of the pins are made long enough to extend down into the shoe for guiding purposes. The extension is turned down smaller than the rest of the pin to allow the compression spring item 14 to be slipped over it. In this manner the springs are both located and kept in position.

The fork-like item 15 operates the material stop at the rear of the tool. This fork is burned out to shape from ⅝-in. thick hot rolled steel plate and then is slab ground on the top and bottom surfaces. There are two slots machined on the lower side into which the cold rolled steel holding straps items 16 are placed. These straps are fastened to the bottom plate with two flat head screws, where they are used to hold item 15 in the groove and also to allow the movement necessary to operate the trip-link item 17 at the rear. Two links are employed, one at each end of the fork. The lower ends of these links have slots machined into them to accommodate the pins item 18. These pins are press-fitted into the fork. A drill rod pin item 19 is pressed into the center of each of these links. The links work in a slot that is provided for them in the lower plate item 1.

The opposite ends of the links carry the small pins, items 20, which slip-fit into the stop item 21. The pins do the actual lifting of the stop, aided by the compression spring item 22. This spring is set into a well that is made from suitable-size gas pipe and has a bottom welded in place to keep the spring from falling through.

The well is marked item 23. It has saw cuts on two sides and the sawed

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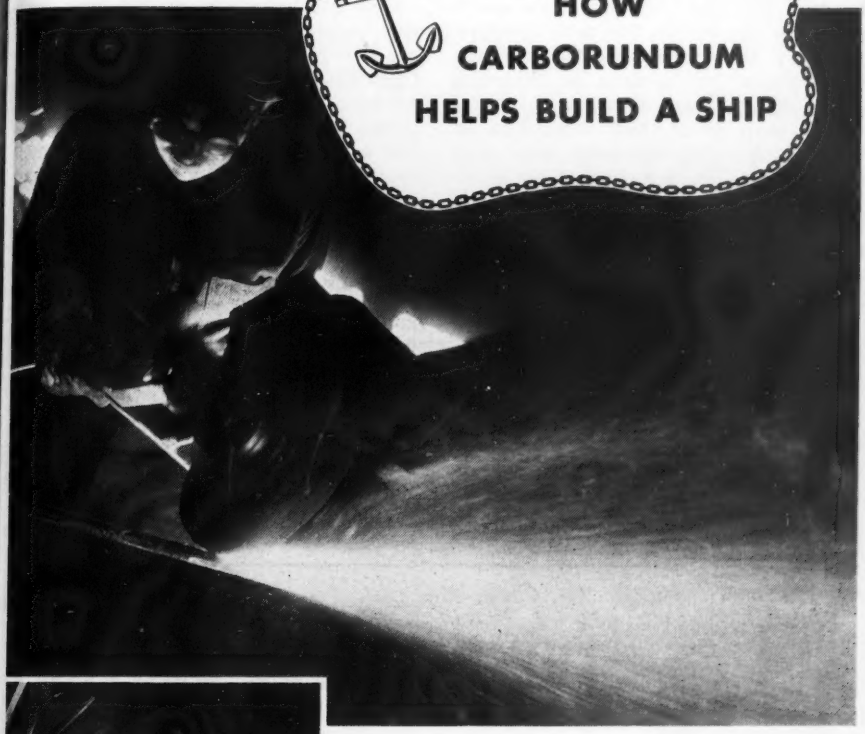

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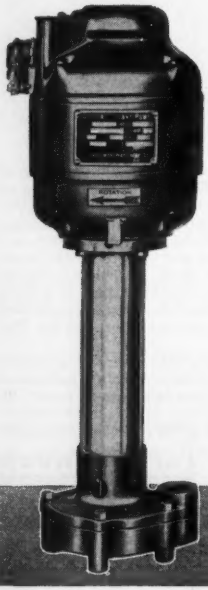
parts are bent outward to form a lug. The well is held in place in the opening provided for it in the lower plate by two flat head screws. Two other slots are cut out in the well to allow the stop item 21 to partially enter the well, which is done so that the pins items 20 may be attached.

The stop is of tool steel and is finished to the required size and shape. It is then hardened to 46-50 Rockwell "C". The upper part of the stop or gage is cut out in a manner to leave two extensions for stopping and gaging the keystone-shape blank material.

A bracket, item 24, is made from hot rolled steel and is fastened to the lower plate with two hex-head screws. This bracket is used to hinge the operating arm item 25. The hinge can be a hex head bolt. The stop pin item 26 is screwed into the lower plate and is set to allow the necessary movement for the arm.

On the other end of the arm a round disc item 29 is fastened by the use of one bolt. This disc is of cold rolled steel and is drilled to carry two ¼-in. drill rod pins that engage the two pins items 27. These pins are force-fitted into the fork and their combined action forms a loose coupling. The flat spring item 28 keeps the arm out. The spring is fastened to the lower plate with fillister head screws. Fig. 5 shows a clear picture of the bottom plate only, with the stop assembly set in place.

Figure 6 illustrates the die assembly or upper part of the tool. Item 29 is the hot rolled steel top plate, finish machined on the top and bottom. The center is burned out and machined down in its thickness to about ¾ in. under the size of the top plate. This center part, item 30, is used as a knocker plate to actuate the inner stripper item 31. They are fastened together with a number of



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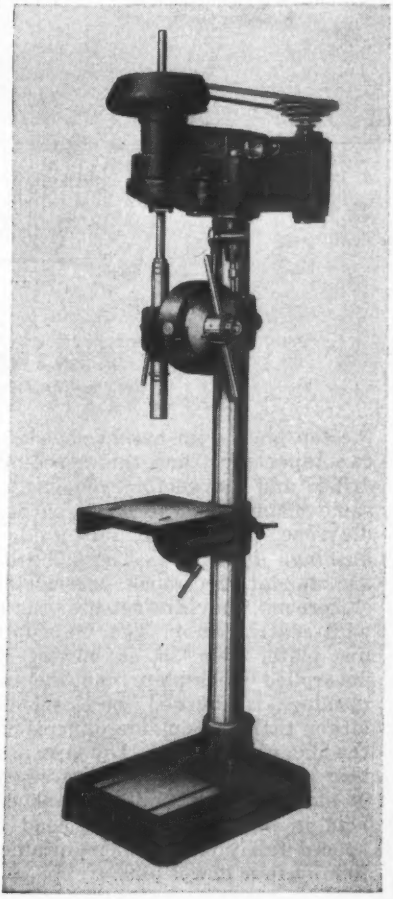
Foreman — "Our operators take to it like ducks to water."

Operator — "The best drill in the shop. Easy to operate, better work."



Here's why:

- Positive gear drive.
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- Easy-to-read depth dial.
- No adjustments required.
- Feed change may be made while machine is running.

We have just prepared a new bulletin No. 3122 on this fine power feed drill. Why not send for it now?

BUFFALO FORGE COMPANY

838 Broadway Buffalo, N. Y.

Branch Engineering Offices in Principal Cities in Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

special stripper screws, items 32, and are maintained at the correct spacing by a number of suitable size stripper pins.

The top shoe, item 33, is burned out to shape from hot rolled steel plate and is finish-machined on both flat surfaces. The shoe is fastened to

The die pieces items 36, 37, 38 and 39 are all made from good grade tool steel. They are rough-machined nearly to the required dimensions and are hardened to about 63 Rockwell "C". After hardening, the die pieces are ground to the drawing dimensions. The die pieces items 40 are

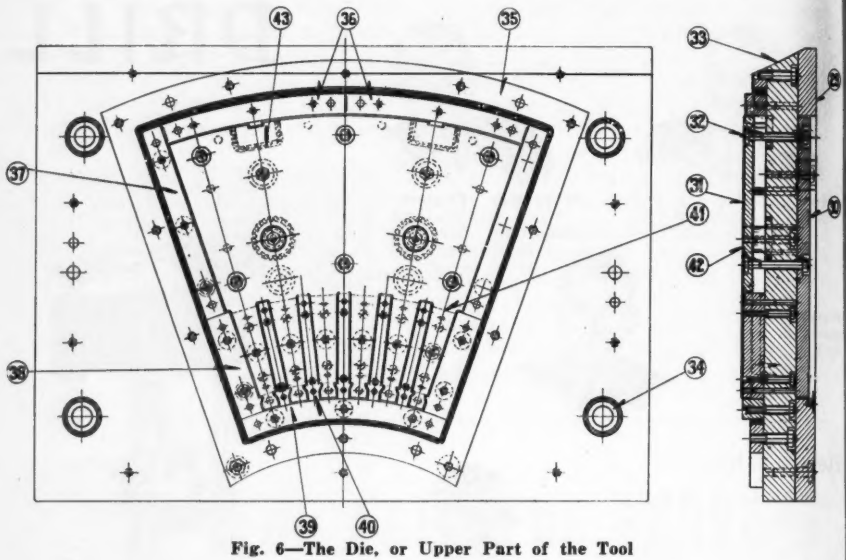

Fig. 6—The Die, or Upper Part of the Tool

the top plate with hex head bolts and two taper pins, and this assembly is drilled and tapped for eyebolts in the same manner as the lower shoe. The die shoe carries the four guide pin bushings items 34. These bushings are standardized stock, carried in the storeroom. They are set into the shoe with matrix alloy. The die supporting plate, item 35, is burned from hot rolled steel plate and the inside opening is burned out somewhat larger than the outside dimensions of the die pieces after they are assembled together. The supporting plate is then mounted on the top shoe and held in position with hex head bolts spaced fairly close and maintained in line by four dowel pins.

made in the same manner as the others and are set in position with the aid of spacers, items 41. These spacers are made of ¼-in. thick cold rolled steel, accurately ground to size, and are fastened to the shoe with two flat head machine screws and two dowels.

The die pieces are all located on the die shoe and are fastened in position inside the die supporting plate with several hex head bolts and dowels. To prevent any spreading of the die pieces when the tool is in operation, melted matrix alloy is poured around the outside of the die pieces until the opening around them is entirely filled.

The punch, item 42, is turned in a

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Now, while you still have time—now is the time to see how much you can save with drills, taps, reamers, hobs, broaches, lathe and planer tools, hack saw blades and other metal cutting tools made of MO-MAX Steel.

Hundreds of users report 15 to 20 percent increased production. Cutting tools made of MO-MAX take 8 percent less steel... are easy to weld, forge, machine and grind... are hard and tough... have superior cutting quality. Why not see for yourself now what they will do in your own shops?

Write for this book of technical details and sources of supply. The Cleveland Twist Drill Co., Cleveland, Ohio.

SHIFT TO MO-MAX FOR QUALITY AND QUANTITY PRODUCTION

MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company, and its only licensed use by others is on steel made and sold by licensees under patents owned or controlled by said Company.

lathe and hardened like the other punch pieces. After it has been finish-ground to the required dimensions, the punch is fastened with a single hex head screw into the opening that is provided for it in the shoe and is kept from turning by the use of two small dowels. To facilitate machining the punch, the hole in the shoe is made larger than the shoulder of the punch and matrix alloy is used to form the side wall. The punch that is used to notch out the openings at the top of the stamping, item 43, is made and mounted in the same manner.

When the tool is assembled and ready for either storage or transportation, it is held together with four hex head bolts each of which passes through a spacer made of scrap gas pipe. These spacers keep the punch and die in alignment and prevent any damage that might occur if the two members of the die were not fastened together.

An Explanation

The Independent Pneumatic Tool Company, Chicago, Illinois, wishes to explain that a part of the material which was used in the article "What Do You Know About High Frequency Electric Tools?" which was written by G. H. DuSell of the Independent Pneumatic Tool Company and published in the September, 1938, issue of MODERN MACHINE SHOP was taken from the booklet "The Facts About High Cycle Electric Tools", published by The Rotor Tool Company of Cleveland, Ohio.

F. L. Grobet Rotary Files, Rasps and Burrs are illustrated and described in a 22-page loose leaf catalog now being distributed by Grobet File Corporation of America, 3 Park Place, New York, N. Y. All of the various types and kinds of hand cut rotary files, hand cut rotary rasps, milled cut rotary files, disc files, and burrs are illustrated and described in detail, together with tables of prices. Copy free upon request.

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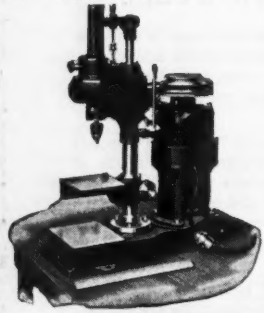

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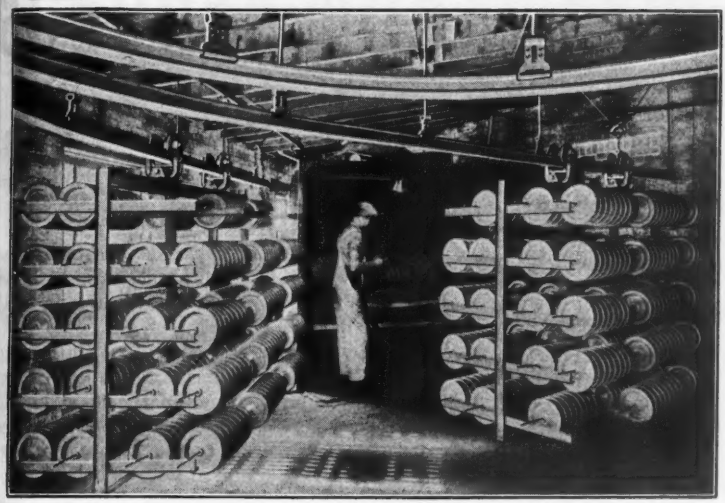

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● Cleveland Tramrail as part of the processing equipment (a production tool if you please) will BRING UP raw material, semi-finished pieces, sub-assemblies, etc., and TAKE AWAY just as fast as the machine will produce or finish, individual pieces or container loads. It handles many kinds of products right through the processes and increases production per man minutes.

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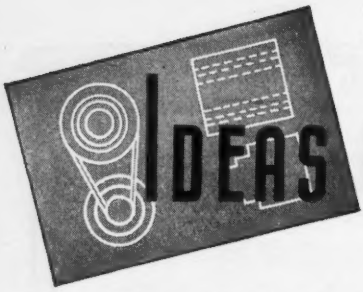
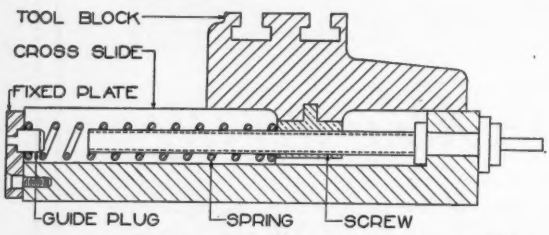


IDEAS FROM READERS

Lost Motion "Take-Up" on Lathe Cross Slide

By H. McHAFFIE, *England*

EVERY experienced mechanic is familiar with the irritating tendency of the cutting tool to "dig in" to the work when there is too much slack present in the assembly of the cross slide screw with the nut on the under-side of the cross slide. This tendency is particularly noticeable in a lathe that has seen many years of service. After continual trouble in the lathe department of the works with which the writer is connected, a determined effort was made to overcome the difficulty.



Device for Taking Up Lost Motion in Lathe Cross Slide

The method described here was finally adopted, providing a very satisfactory solution to the problem with a minimum of outlay.

A steel plate 2x3x¼ in. was provided for the open end of the U-shaped slot cast in the top of the cross slide, machined to clear the top of the cross slide vee-ways. A stiff spring of suitable length and pitch was then passed over the free end of the screw cross slide, one end of the spring abutting against the plate and the other end against the nut, as shown. The plate was then anchored in place.

The pressure exerted by the spring on the cross slide nut takes up all lost motion due to wear of these parts and practically eliminates the likelihood of the tool digging in when cutting. For best results, however, it is essential that the tool be set so that the pressure on the nut will be in line with the direction of pressure on the tool when under cut.

Knockout Bar Improvement

By CHAS. H. WILLEY

DIE setters and pressroom foremen will be interested—and tool designers should be — in a change we made recently in the design of the stripper or knockout bars on the stamping presses. As shown in the illustration, one end of the knockout bar, A, is forged into an offset as shown at B. This design makes it possible to use a hammer to rap out a stamping when poor adjustment of the knockout bolt C permits the

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"These blades give us about 50% more life than the HIGH SPEED steel blades. We figure our saving by using these blades about 60%, and highly recommend these blades on power hack saws . . . "

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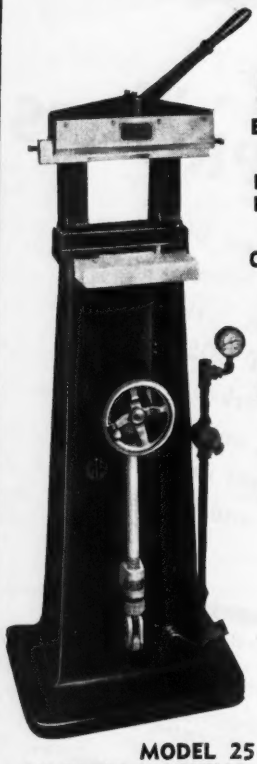

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REQUIRES ONLY FRACTION OF APPLIED PRESSURE AS COMPARED TO STAMPING.

QUICK SET-UPS

MODEL 25
HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. HI-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
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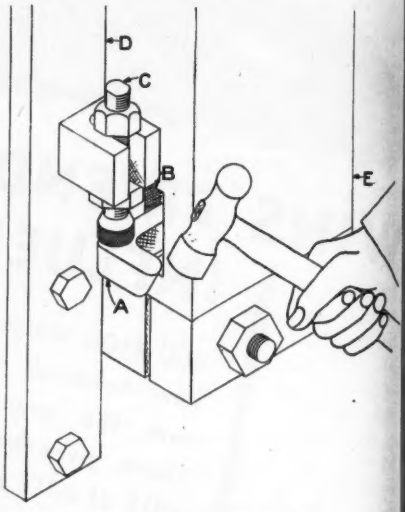
stamping to remain in the die. This also sometimes happens when the crank does not complete a full revolution and fails to reach the point necessary for operation of the knockout.

Continued abuse of the ends of the knockout bars proved that they



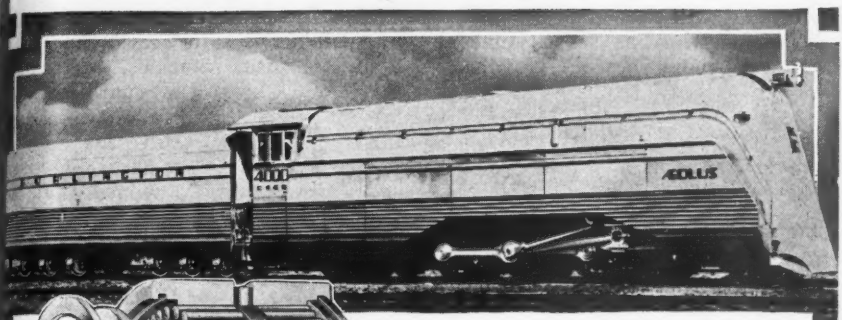
Knockout Bar Designed with Offset for Application of Hammer

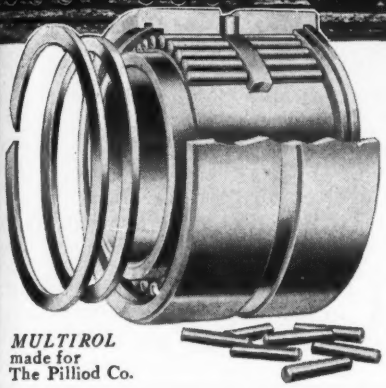
should be redesigned so as to permit the use of a hammer when necessary. The offset is required on one end only as the bar passes through the slot in the ram-head E.

Hand Protector for File

By A. H. WAYCHOFF

WITH all that has been done to guard machines, belts, drives, and other mechanical devices, little has been done in the way of safeguarding hand tools. In fact, not much *can* be done, other than to enforce the use of goggles and prohibit the use of mushroom hammers and chisels. However, here is a simple





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Precision Needle Bearings

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The new locomotives offer a typical illustration of how old conditions are being met with far better results by McGILL *MULTIROL* Bearings — the original needle type. In the valve gear, for instance, they reveal great improvements over bronze bushings which they replace. They assure constant alignment and permanent valve setting. They greatly reduce bearing replacements and servicing. They require less oiling and greasing.

The great load capacity of McGILL *MULTIROL* Bearings in limited space enables them to far outrun plain bronze or babbitt bearings and ordinary friction types, especially under sustained heavy or intermittent shock loads. Their compactness makes them frequently interchangeable dimensionally with existing bearings, too.

Learn all the advantages of McGILL Multirol Bearings. Send for Bulletin No. 37. No obligation, of course.

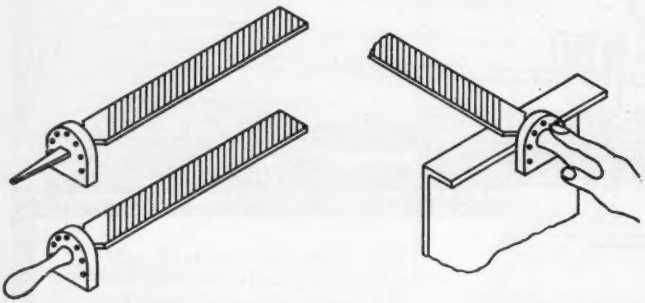
McGILL MANUFACTURING CO.

1500 N. Lafayette Street

VALPARAISO, IND.

device that will save many knuckles.

Everyone who has served time at the bench knows how easy it is to push a file just a little too far and rap one's knuckles against a sharp or ragged edge on the work, resulting in bruises or cuts. A rubber heel, either new or old, drilled through the center and then slipped over the tang of the file before driving the handle on, will serve as a very good guard against bruised knuckles. With such a guard on the file, the workman can file with more freedom, knowing that his hand is protected. After a bench hand or floor assembler has used such guards, he will not be without them.



A rubber heel, drilled and slipped onto the file tang ahead of the handle, will protect the knuckles from abrasion.

Indexing Milling Fixture

By JOHN JERGENS

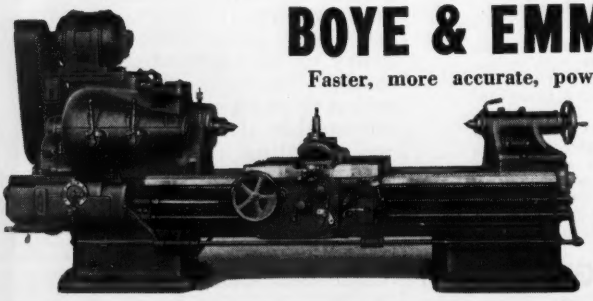
ILLUSTRATED in the drawing is an indexing fixture of unusual design, developed for use in milling six

Announcing **the Newly Designed**

Model "E"—24-inch

BOYE & EMMES LATHE

Faster, more accurate, powerful and convenient.



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Longer Tool Life

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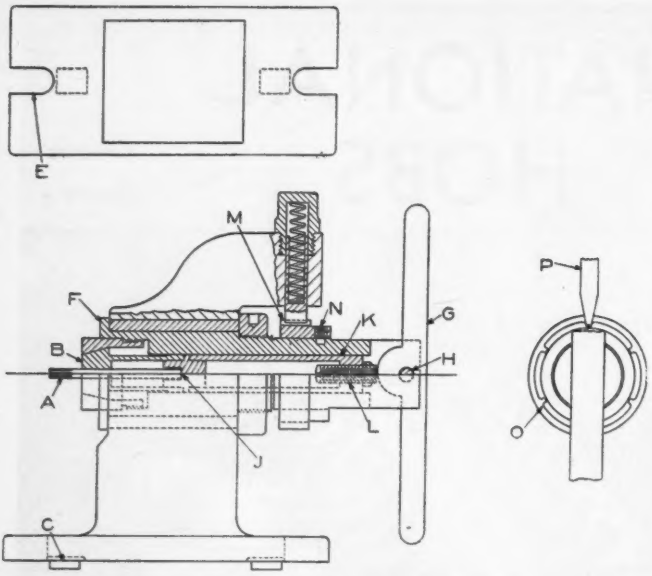


Drawing Showing Fixture Used for Milling Splines in a Steel Shaft

splines in a steel shaft.

The fixture consists of a light casting bored to receive a rotating shaft F which has a slot in one end into which the cam handle G is fitted and secured by means of a dowel pin H. A push rod K is provided with an adjusting screw I to secure proper tension on the collect B. An indexing plate M is attached to the rotating shaft F by means of a set screw N. A stop J located in front of push rod K provides for stopping the work A. The slots in the indexing plate M are flared at the edges as shown at O in order to allow spring plunger P to lift freely while shaft F is being rotated.

In use, the fixture is located on a hand milling machine by means of keys C and held by bolts in the slots E. The cam handle G is moved forward pushing against the screw L, the action induced herein causes the push rod K to be also moved forward, As the push rod K is moved forward, it forces the steel shaft A out and at the same time tightens the collet B around the shaft A, thus holding it steady for milling.

After a spline has been milled in the shaft and the shaft pulled back by releasing the cam handle G, the handle is turned to the right, rotating the shaft F and the indexing plate M. As the indexing plate rotates, it forces the spring plunger P out of one slot in the plate and is then turned until the plunger seats itself in the next slot. These operations are repeated until the six splines have been milled in the shaft.

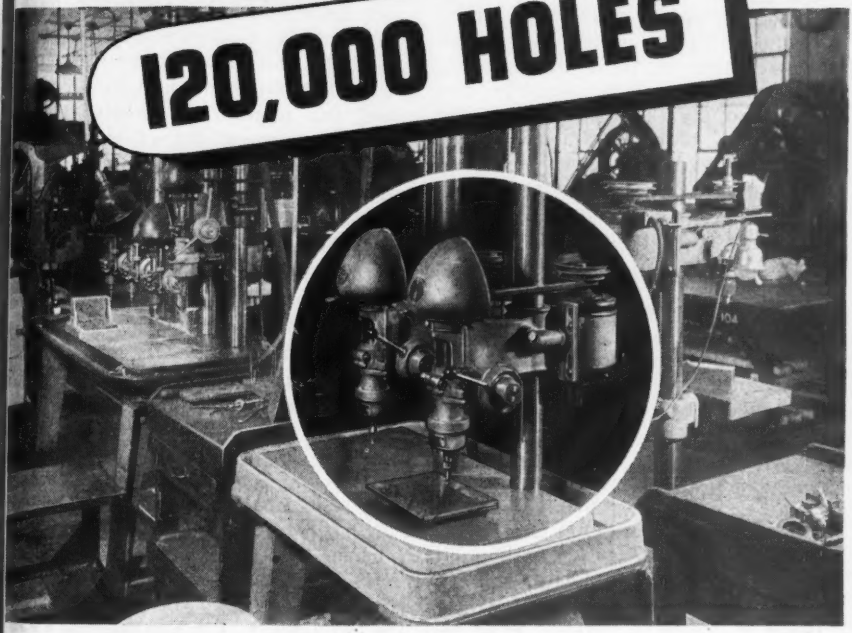
Atlas F-Series Lathes With Power Cross Feed. A special "preview" announcement from Atlas Press Company gives first official news of the Atlas lathes for 1939. The company has confirmed reports that power cross feed mechanism will be furnished as standard equipment with their new "F-Series" 10-inch models, the first time this feature has ever been incorporated in a popular priced precision bench lathe.

The "preview" folder contains pictures and brief descriptions of all new Atlas 1939 machine tools and shop equipment which will be covered completely in the Atlas General Catalog No. 39 to be released during December. Copies of Catalog 39 can be reserved by writing Atlas Press Company, Dept. 7, Kalamazoo, Michigan.

Please mention MODERN MACHINE SHOP when sending inquiries to manufacturers of advertised products.

TAPPED

120,000 HOLES



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That is the record made with Delta drill presses and tapping equipment with 3-48 and 4-32 taps—in steel—at the Hedman Mfg. Company, makers of the famous F & E Check Protectors. And in this same plant Delta Drill Presses drill 30,000 holes a day, day after day, throughout the year.

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Consider these advantages of the Delta Drill Press—Low first cost, economical operation, low maintenance cost, portability, flexibility, compactness, and prompt delivery—and see if you cannot cut your production costs by adopting these efficient light power tools. Write today for the full story of other installations, specifications and prices on the complete line of Delta Drill Presses.

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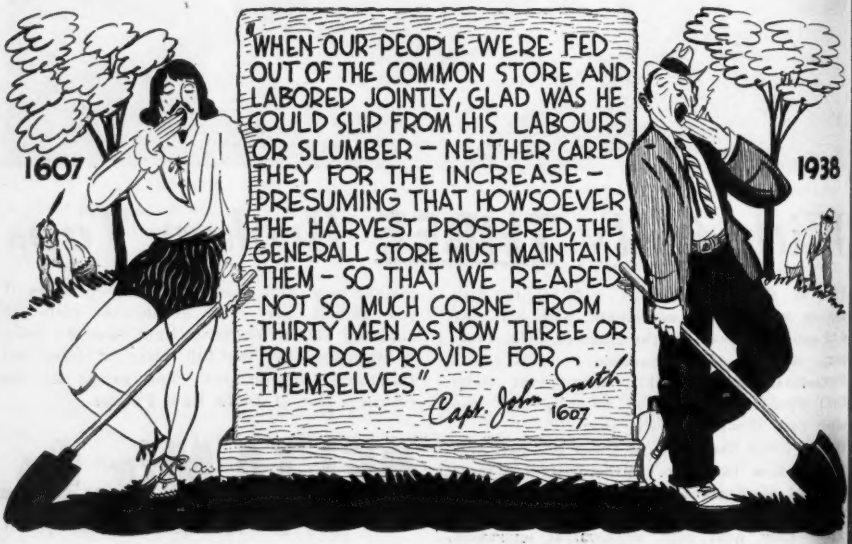
Over the Editor's Desk

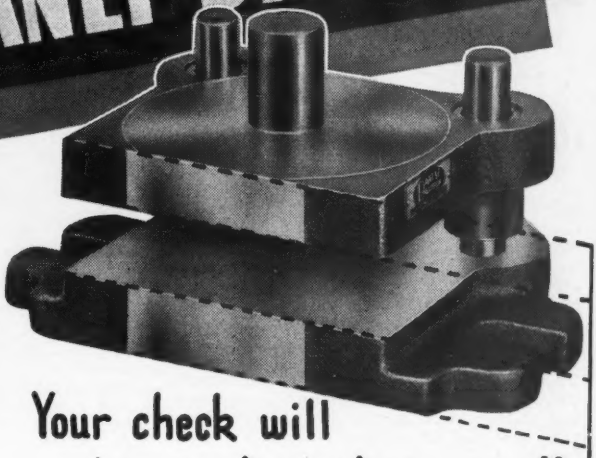
WHEN the first English settlement in America was founded at Jamestown in 1607, the one important concern of the settlers was the food supply. This they attempted to ensure by planting and cultivating a common garden in which the labor and harvest were to be shared by all alike. The tendency on the part of some to avoid manual labor resulted, however, in such a shortage of food that the colony was in danger of starvation, and it was found that only by giving each man his own plot and making him responsible for his own maintenance could success be assured.

Human nature hasn't changed one iota since Captain John Smith's time, and unless a determined effort is made to find an answer to our present unemployment and relief problem, the number of people drawing their sustenance out of the common fund will continue to be five times as great as it actually should be. If past experience is any criterion, the government's solution — regardless of party—will never be anything more than a makeshift; our industrial and commercial leaders might as well face the fact that if an early and satisfactory solution is to be found, they will have to get someone busy at finding it.


1607
"WHEN OUR PEOPLE WERE FED OUT OF THE COMMON STORE AND LABORED JOINTLY, GLAD WAS HE COULD SLIP FROM HIS LABOURS OR SLUMBER – NEITHER CARED THEY FOR THE INCREASE – PRESUMING THAT HOWSOEVER THE HARVEST PROSPERED, THE GENERALL STORE MUST MAINTAIN THEM – SO THAT WE REAPED NOT SO MUCH CORNE FROM THIRTY MEN AS NOW THREE OR FOUR DOE PROVIDE FOR THEMSELVES"
Capt. John Smith 1607
1938

(Reproduced Courtesy of Barron's Publishing Co.)

THE THINGS YOU'LL NEVER NEED TO DO WITH A DANLY DIE SET



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Our whole operation is keyed to making one die set exactly match the next one of the same size, or the next thousand.

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You can lay out your work accurately on a Danly Shoe or Holder with certainty that it will be right and will work right when you are done.

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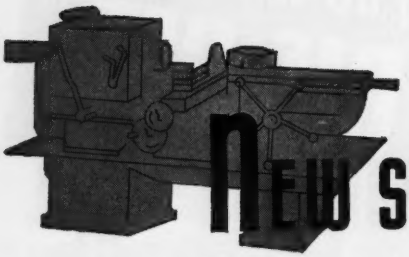


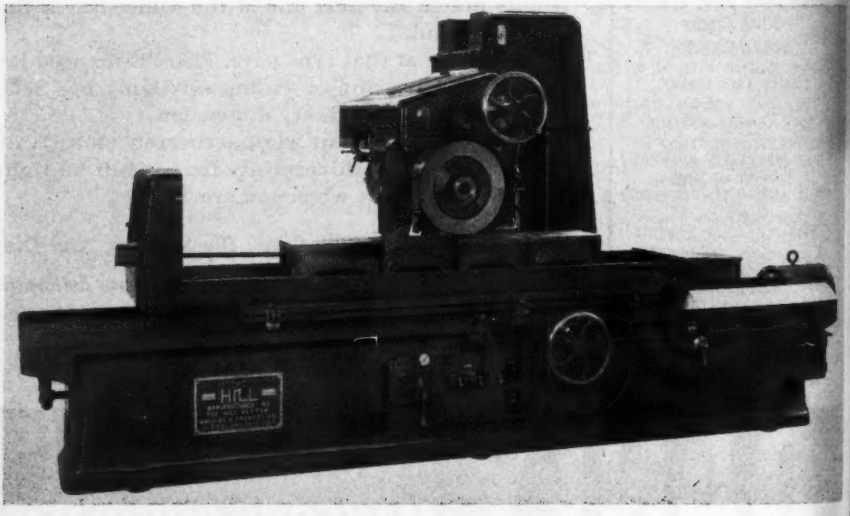
NEW SHOP EQUIPMENT

Hill Hydraulic Horizontal Grinder

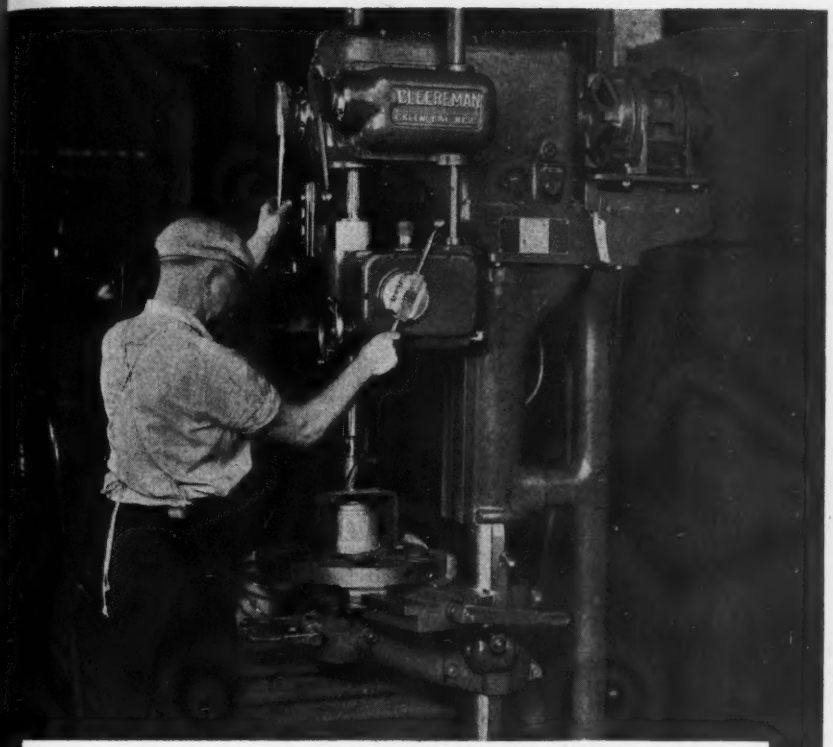
A heavy duty precision hydraulic surface grinder, illustrated herewith, has been placed on the market by The Hill Clutch Machine & Foundry Co., 6600 Breakwater Ave., Cleveland, Ohio. The mechanism is mounted on a box-type alloy cast bed, ruggedly ribbed for permanent accuracy. The table is also an alloy casting, scientifically heat treated to preclude the possibility of warpage and thus assure permanent accuracy. The alloy cast column is of unusually heavy design with large and long bearing surfaces to assure permanent accuracy for the wheel slide.

The wheel spindle is driven by a dynamically balanced built-in motor. The spindle is of alloy steel, hardened, ground and lapped. Rapid traverse is provided for raising and lowering the wheelhead, with hand control for final adjustment. The table feed and cross feed are fully hydraulic, all gears being eliminated. All controls are centrally located within reach of the operator's station. Forced feed lubrication is provided to the table ways and spindle bearings and a large supply tank with motor driven pump is provided for coolant.

The working surface of the table is 18 to 24 in. wide by 5 to 20 in. long as required. Grinding wheels are of standard sizes up to 6 in. wide. The table speed can be instantly varied up to 100 ft. per minute and the cross feed can be oscillated at a constant feed or adjusted from ⅛ to 2 in. at each reversal of the table for a jump feed. Five motors are required, as follows: one built-in



Hill Hydraulic Horizontal Grinder



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JIG BORERS

Precision built for jig, fixture, tool and die work. Especially adapted to manufacturing where unusual accuracy is required. Also for experimental work and short run production. They handle drilling, boring, reaming, tapping and light milling.

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Round or square columns . . fully geared . . anti-friction . . automatic oiling . . single lever control for feed . . single lever control for speeds . . reversing motor, no friction clutches . . standard range, 21" to 30" sizes . . Capacity 1½" thru S.A.E. 1035 steel.

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You do not buy a 50 H.P. motor for a 5 H.P. drive. It is good economy to get the right motor for the job. • Why, then, use large heavy, tool room type milling machines to do production jobs. • Kent-Owens Millers are built for production. While their precision places them in many tool rooms, they have the speed, ease of set up, ease of handling that is demanded by production. • Plenty of "beef" for the job—but no surplus—they're "trained for action". They are saving money in hundreds of shops—why not in yours?

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KENT-OWENS MACHINE CO.
958 Wall St. Toledo, Ohio

main spindle drive motor 15 to 40 h.p. depending upon the size of the grinder, one 10 h.p. table motor for the hydraulic pump, one 1 h.p. rail motor for rapid traverse, one 1/3 h.p. coolant pump motor, and one ¼ h.p. lubricating pump motor.

Gardner No. 179 72-In. Horizontal Disc Grinder

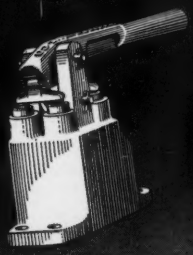
Gardner Machine Company, 428 E. Gardner St., Beloit, Wis., has brought out a horizontal grinder which—like the several other sizes and types of horizontal grinders in the Gardner line—is adapted to those numerous operations where the only requirement is a flat surface. When equipped with the Gardner Hand-Operated Swinging Work Table, the machine may be used to produce two surfaces of one casting in accurate relation to each other. The grinder is designed particularly to meet the requirements of those who prefer V-belt motor driven equipment and who favor the use of standard motors.

The machine is of larger dimensions and greater weight than the older models, and the design embodies two important features: (1) It is equipped with a new louvre-type removable guard ring which aids materially in efficient removal of the dust and grit of grinding. (2) It carries a swinging bar-type dresser with which the wheel can be efficiently dressed at any time.

The machine is equipped with a steel disc wheel 72 in. in diameter and traveling in a horizontal plane. The wheel is mounted on a substantial supporting flange, 40-in. diameter, fitted to the upper end of the main spindle. Upon the lower end of the machine spindle is mounted a large eight-groove sheave to which power is transmitted through heavy duty V-belts from a standard fully enclosed ball bearing type 40 h.p. motor carried on a hinged bracket at the side of the base. Belt replacement is easily accomplished by removing the belt guard.

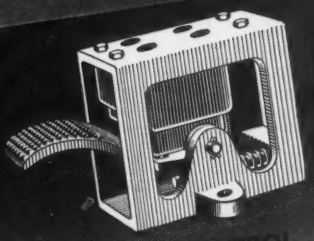
To the top of the machine base is attached a unique guard ring of new design to which may be secured work holders or special attachments. The guard ring is removable for convenience when mounting abrasives on the steel wheel. Louvres on a guard ring cast at the proper angle quickly remove dust. The dust exhaust panel is an integral part of the base casting and is of special tapered design providing for maximum exhaust when connected with a

ROSS *Air Control* VALVES *are* STURDILY BUILT



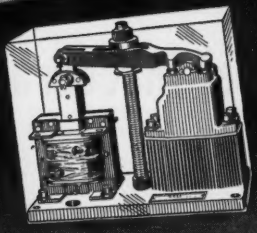
HAND CONTROL

All working parts made of hardened steel to give maximum service. Poppets of non-corrosive metals with oil resistant rubber seats, offer long life.



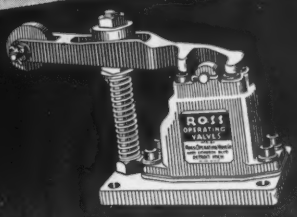
FOOT CONTROL

Bracket or frame is a heavy casting which will stand up under the roughest sort of handling. Foot treadle is overweight for extra strength.



SOLENOID CONTROL

Oversize solenoid for unfailing service. Extra heavy base for mounting purposes. Heavy pressed metal protecting cover. Overweight lever and links to meet severest demands.



MECHANICAL CONTROL

Spring and spring rod are oversize for extra strength. Hardened roller for maximum wear. Heavy base to meet extreme demands.

THE BRIDLE FOR
IR HORSEPOWER

REGARDLESS of type or size, or the use to which they are put, Ross valves are all fundamentally alike, all sturdily built. Heavy bronze cast body with walls much thicker than usually considered necessary, each individual part designed with an extra strength factor which provides many years of dependable service—under severest conditions. For that unfailing service install Ross valves on your air-actuated equipment.

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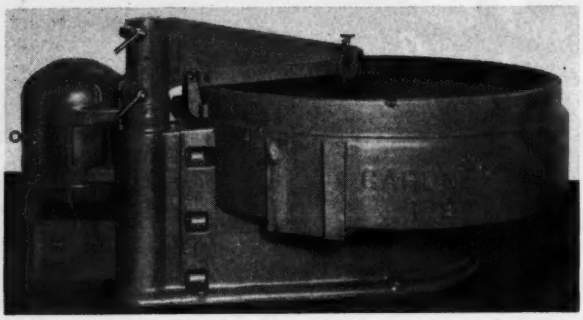

Gardner No. 179 72-In. Horizontal Disc Grinder

blower of proper capacity.

The machine can be operated either wet or dry and when operated as a wet grinder, a welded steel outside acetylene tank complete with motor pump and fittings is supplied.

The application of a Gardner "Wire-Lokt" Abrasive Wheel to the steel wheel of a No. 179 Horizontal Grinder is a simple operation. The abrasive is built in six sections for easy handling and cored holes are provided in the face of the abrasive itself so that the "Wire-Lokt" screws enter the steel wheel from the face of the cutting member, eliminating the necessity of removing the large heavy steel wheel from the machine spindle. The spindle is 5.511 in. diameter at the upper end and is mounted on high grade ball bearings. The lower bearing is a combination radial and thrust type, with a rated load of 38,000 lbs. Spindle speed, 325 r.p.m. Height of disc wheel from floor 32-3/16 in. Floor space required, 6 ft. 8 in. x 9 ft. 4 in. Motor recommended, 40 h.p. 1150 r.p.m. Weight, including motor, 11,500 pounds.

Sebastian Stremeline Type S Lathe

The illustration shows the new "Stremeline" Type S Lathe which has been placed on the market by The Sebastian Lathe Company, Cincinnati

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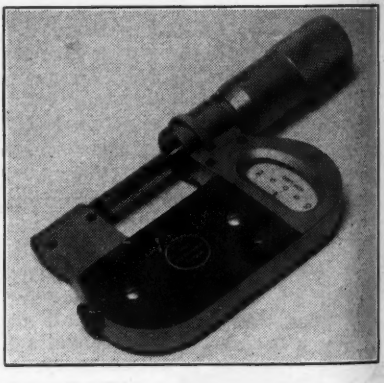

Will measure single pieces as well as check mass production and serve as a comparator. Indicator scale calibrated in .0001" with "tenths" vernier on barrel sleeve. Anvil faces are tungsten carbide.

Contains eleven features and advantages fully described in our six-page catalog. Write for your copy today.

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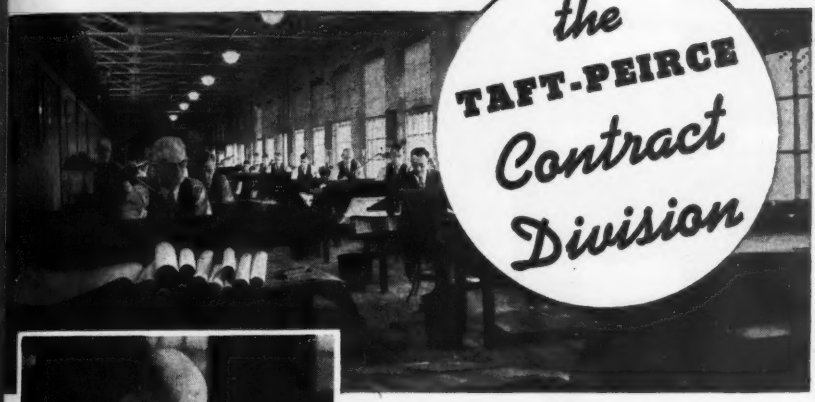

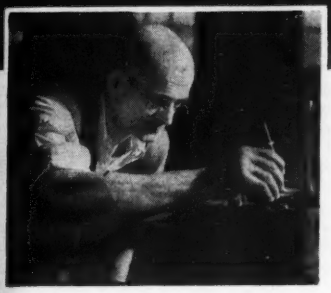

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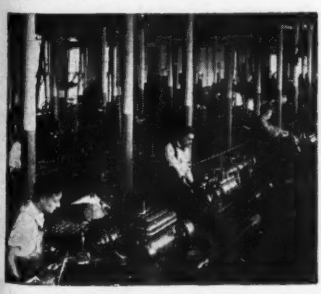

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At your disposal here are more than 1,000 modern machine tools, more than 200,000 square feet of floor space. And here you can obtain a single part or quantity production . . . made *as* you want it, *when* you want it . . . at a cost kept down by overhead-spread.

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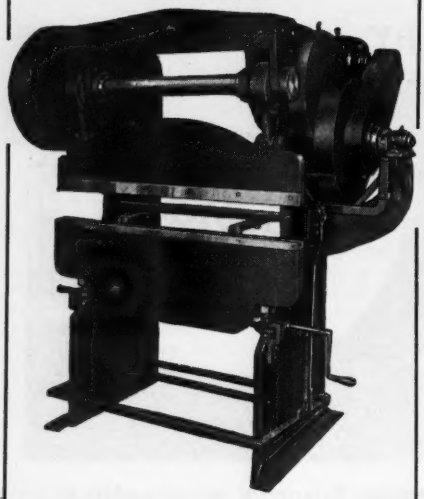
CHICAGO STEEL PRESS

No. 253



does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

Write for Circular No. 253

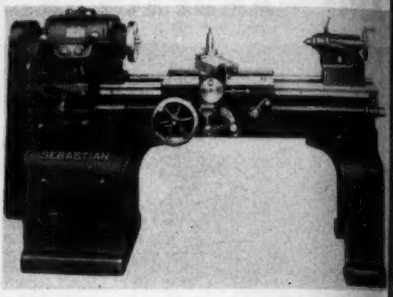
DREIS & KRUMP MFG. Company

7418 LOOMIS BLVD.

CHICAGO ILLINOIS

Ohio. The lathe is available in 12, 1 or 20-in. swing and in bed lengths o from 3 ft. to 8 ft. in the 12-in. size t 6 ft. to 24 ft. in the 20-in. size.

The feature of the Type S lathe i the Timken Geared Head. Timken bear ings are used on all shafts in the head stock including the spindle, assurin



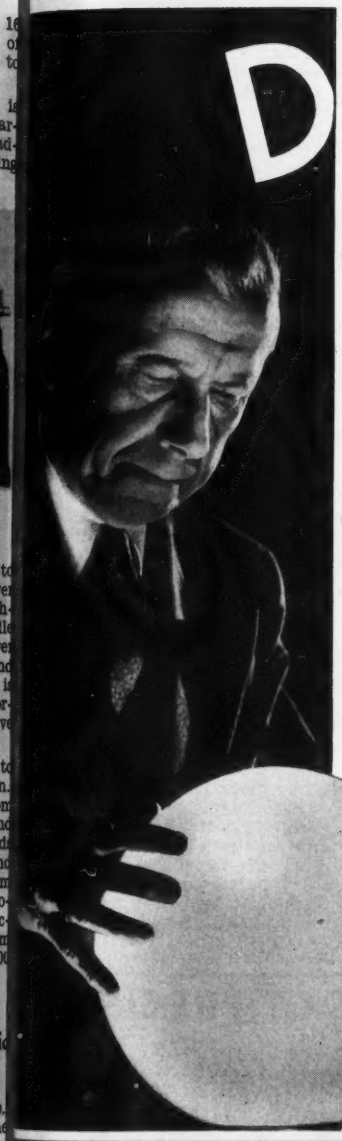
Sebastian Stremeline Type S Lathe

accuracy and an increase of from 15 t 20 per cent in the amount of powe available over the machines built with out Timken Geared Heads. The spindl bearings are preloaded. A single leve controls the switch for start, stop an reverse. A patented reversing switch i used which can not be thrown from for ward to reverse as there is a positive stop in the neutral position.

The feed ranges are: 12-in., 0.00175 t 0.222 in.; 16-in., 0.002 to 0.252 in.; 20-in. 0.008 to 0.252 in. The thread range, from 3 to 384 on the 12 and 16-in. sizes and 3 to 96 on the 20-in. sizes. Eight speeds are provided ranging between 50 and 1200 r.p.m. on the 12-in. size to from 14 to 350 r.p.m. on the 20-in. size. Motors required, 1, 2, and 3 h.p. respectively. Approximate weight, crated, from 1350 lbs. for the 4 ft. 20-in. size to 360 lbs. for the 6 ft. 20-in. size.

Van Norman Model 120 Automatic Internal Radius Grinder

The Van Norman Machine Tool Co. Springfield, Mass., has developed the Model 120 Automatic Internal Radius Grinder, designed particularly for grinding raceways of the smallest ball bearing outer rings up to the 204 size (approximately 1⅞-in. diameter). The Model 120 is said to provide a very satisfactory method for small-racewa



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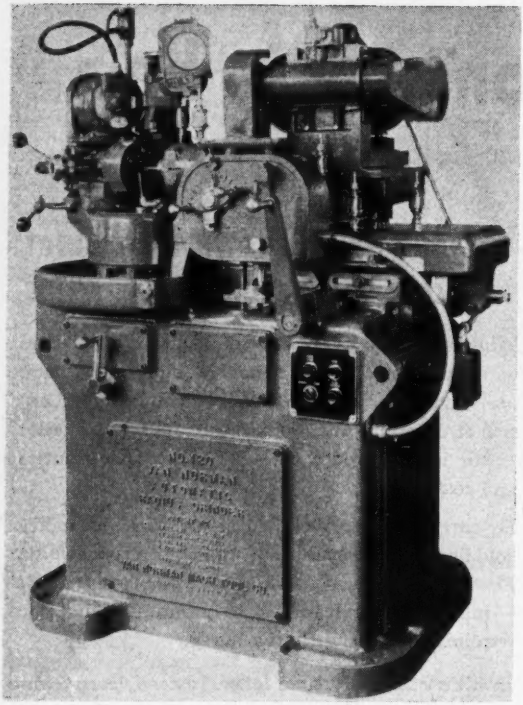

Van Norman Model 120 Automatic Internal Radius Grinder

grinding in the aviation, instrument, electrical and automotive fields, and also in general industry wherever small diameters must be spherically ground.

The size of the Model 120 provides convenient means for grinding small races. However, every part of this model is designed and built to assure the vibrationless operation necessary in satisfactory spherical grinding. The latest Van Norman design of three-point contact ball bearing oscillating bearing is used on the Model 120, assuring rigidity. A crank drive provides a positive smooth movement of the oscillating units. All slide movements are by simple mechanical means.

To operate, the race is loaded in the holding fixture, and the machine is started by a finger-touch lever which automatically moves the wheel into grinding position and coincidentally retracts the wheel to compensate for stock removal. The workhead automatically rotates and oscillates and the wheel automatically feeds into the work. When the race is ground to size, the wheel automatically removes to unloading position, and the workhead stops. The complete grinding cycle functions automatically by simple standardized electrical controls concealed in back.

The Model 120 is arranged not only for electric gaging, but also with an electric control on the feed drum so that when the wheel is fed to the point of proper size, the slide will automatically remove to unloading position.

To provide the high workhead speeds needed, the Model 120 has a motorized workhead delivering 2000 r.p.m. to the workhead spindle, and rigidity far in excess of machine capacity. The wheel spindle operates up to 40,000 r.p.m., driven by a 3 h.p. motor belted to a ball bearing jackshaft belted in turn to the wheel spindle. The drive unit is mount-

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ed directly on the wheel slide. Speed changes to the wheel spindle are by pulley changes on the spindle drive unit.

Radicon Worm Speed Reducer

Thomas Prosser & Son, 120 Wall St., New York, N. Y., announces that they have been appointed exclusive distributors in the United States for the Radicon Worm Reducer, developed by David Brown & Sons of Huddersfield, England. The safe rating of the Radicon Reducer is so tremendously increased that a 30 per cent reduction in size is possible for any given duty, resulting in lower first cost. Its 50 per cent reduction in oil drag gives increased efficiency and low running cost. Automatic oil circulation eliminates all need for maintenance.

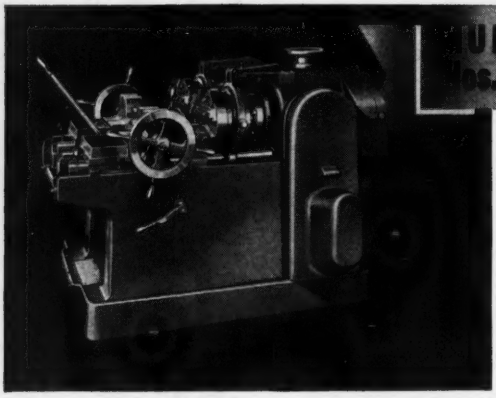
All bearings in the Radicon Reducer are positively lubricated, a continuous oil circulating system working in both directions of rotation and providing positive lubrication.

Efficient cooling is a dominant factor in the high-load-carrying capacity achieved by the Radicon Reducer. All processes of heat interference are employed including radiation as a result of large surface area, convection resulting from vertical ribbing, and conducti due to a stream of cold air of hi velocity being projected along the ho zontal channels by a fan.

The maximum load-carrying capac

Radicon Worm Speed Reducer

is made possible by the special ge tooth shape in conjunction with speci cooling methods. A complete stock Radicon Reducers in various sizes



MURCHEY Nos. 11 & 22

PIPE AND BOLT Threading Machines

FEATURES:

Heavy forged steel spindle operates o Timken pre-loaded roller bearings throughou Worm Drive, actually improves with wear Enclosed motors—push button control.

Tangential Chaser Hardened and Groun Die Heads.

Receding Die Heads for Pipe Threads. Adjustments made without shifting gear

CAPACITIES

No. 11 (Single or Double)	No. 22 (Single or Double)
¼" to 1" U.S.S.	½" to 2" U.S.S.
¼" to 1 ½" S.A.E.	½" to 2 ½" S.A.E.
⅛" to 1" PIPE	½" to 2" PIPE

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Now! with 3 speed Control

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Built in Two Sizes

No. 5 Size—5" diameter round or 5"x10" flat.

No. 8 Size—8" diameter round or 8"x16" flat.

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ed directly on the wheel slide. Speed changes to the wheel spindle are by pulley changes on the spindle drive unit.

Radicon Worm Speed Reducer

Thomas Prosser & Son, 120 Wall St., New York, N. Y., announces that they have been appointed exclusive distributors in the United States for the Radicon Worm Reducer, developed by David Brown & Sons of Huddersfield, England. The safe rating of the Radicon Reducer is so tremendously increased that a 30 per cent reduction in size is possible for any given duty, resulting in lower first cost. Its 50 per cent reduction in oil drag gives increased efficiency and low running cost. Automatic oil circulation eliminates all need for maintenance.

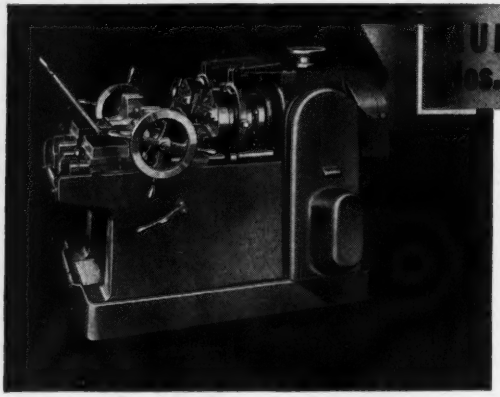
All bearings in the Radicon Reducer are positively lubricated, a continuous oil circulating system working in both directions of rotation and providing positive lubrication.

Efficient cooling is a dominant factor in the high-load-carrying capacity achieved by the Radicon Reducer. All processes of heat interference are employed including radiation as a result of large surface area, convection resulting from vertical ribbing, and conduction due to a stream of cold air of high velocity being projected along the horizontal channels by a fan.

The maximum load-carrying capacity

Radicon Worm Speed Reducer

is made possible by the special gear tooth shape in conjunction with special cooling methods. A complete stock of Radicon Reducers in various sizes is



URCHEY
os. 11 & 22

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Heavy forged steel spindle operates on Timken pre-loaded roller bearings throughout. Worm Drive, actually improves with wear. Enclosed motors—push button control.

Tangential Chaser Hardened and Ground Die Heads.

Receding Die Heads for Pipe Threads. Adjustments made without shifting gears.

CAPACITIES

No. 11 (Single or Double)	No. 22 (Single or Double)
¼" to 1" U.S.S.	½" to 2" U.S.S.
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Other products: Collapsible Taps, Self-Opening Die Heads, Reaming, Chamfering and Drilling Machines, Roller Pipe Cut-off Machines.

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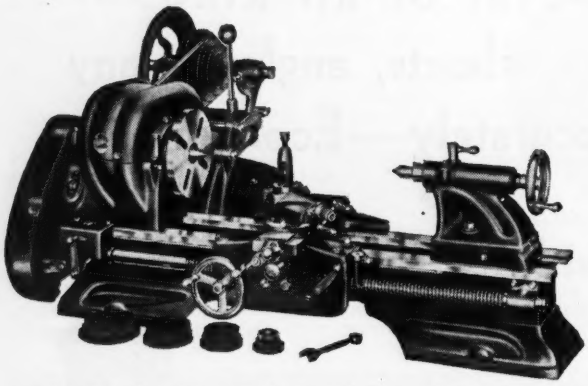
available for immediate delivery, also cone ring patented couplings and base plates.

Atlas F-Series 10-In. Back Geared Screw Cutting Lathe

Atlas Press Company, 1146 N. Pitcher St., Kalamazoo, Mich., has brought out a 10-in. back geared screw cutting lathe equipped with power cross feed as standard equipment, to be known as the



Atlas F-Series 10-In. Back Geared Screw Cutting Lathe

Atlas F-Series. The lathe as illustrated has a 36-in. bed and will swing 18 in. between centers. The power cross feed and longitudinal feeds are instantly reversible.

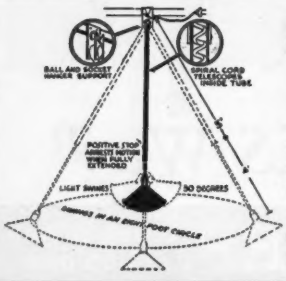
Important features are the horizontal or vertical bench type countershaft, ¾-in. lead screw, headstock safety guard, precision ground bed ways, and custom-built spindle bearings. Sixteen speeds are available and from 4 to 96 threads per inch can be cut.

The lathe is available in four bed lengths: 36, 42, 48 and 54 in., to swing 18, 24, 30 and 36 in. between centers. Weights are 259, 271, 279 and 284 lbs. respectively with the horizontal countershaft. With the vertical countershaft the weight is slightly less. Standard equipment includes a 6-in. face plate, two 60 deg. lathe centers, a reducing sleeve for headstock center, combination tool post and compound wrench, and instruction book.

Ex-Cell-O "Style 35" Thread Grinder

Designed primarily to supply the growing demand among machinery manufacturers for a thread grinder adapted specifically to the grinding of long lead screws, the thread grinder shown in the illustration has been introduced by the Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich. In general design the machine follows standard Ex-Cell-O practice as exemplified on the No. 35 Universal Thread Grinder. The new machine, however, will grind threads up to 36 in length between centers. With a special work table extension and tail-stock, available as extra equipment, threads may be ground on work up to 60 in. in length.

Diameter capacities are such as to take care of virtually any conceivable requirement in the machinery field, being 8 in. maximum when using an 18-in. grinding wheel and 12 in. when using a 13-in.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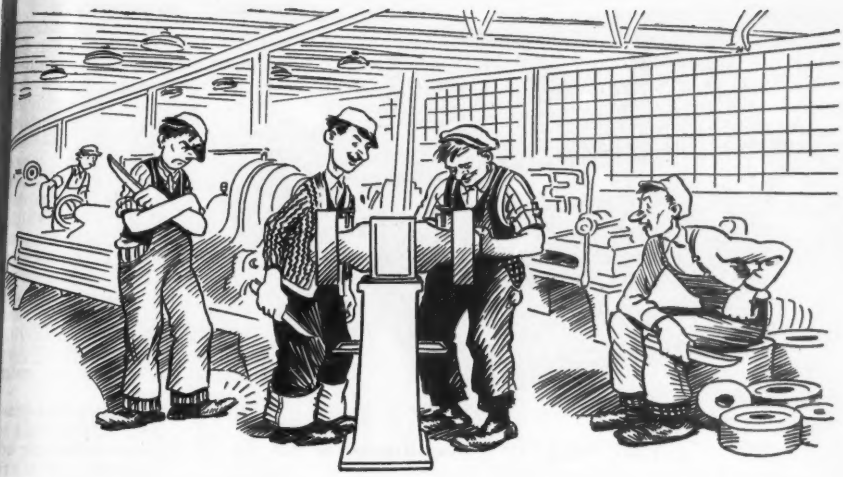
LIGHT SWINGS
90 DEGREES
SWINGS IN AN ENTIRE FOOT CIRCLE

Stop Eye Strain with "ZIG" Lights

Put light where you need it instantly. No eyestrain. No glare. Moves in diameter of 2 feet to 10 feet also up and down, depending on size. "STAYS PUT". Sturdy construction. Easy to install. Fasten to ceiling or to a machine. Write for circular and prices and state where you intend to use it.

J. ZAGORA MACHINE & GEAR CO.

1325 SOUTH MINT ST. CHARLOTTE, N. C.



Hisey "Economy" Grinders at New Low Prices MAKE WAITING UNNECESSARY

You can now have 5 of these new "ECONOMY" Grinders at the former cost of three. Scattering more of these Grinders throughout the shop eliminates the waiting time and "grinder side chats" which cut deep into production.

This new line has been designed and priced to meet the demand of present day conditions. A few examples of the new prices for Pedestal Grinders are as follows:

¾ H.P.	for 8x1	wheels	$ 85.00
1 H.P.	for 10x1¼	wheels	110.00
2 H.P.	for 12x2	wheels	165.00
3 H.P.	for 14x2½	wheels	185.00
5 H.P	for 14x3	wheels	235.00
5 H.P.	for 18x3	wheels	255.00

Bulletin No. 54 M just off the press on request.

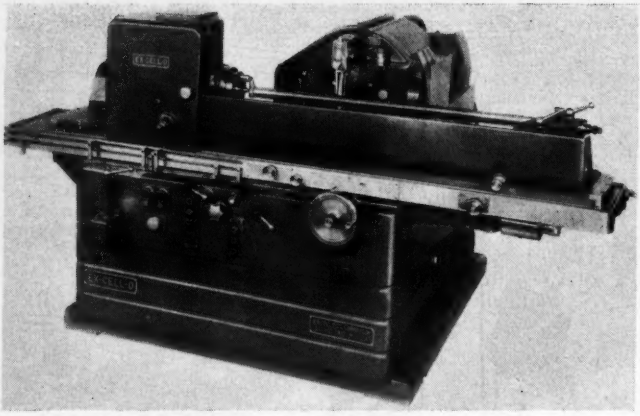
THE HISEY-WOLF MACHINE CO.

"It's High Grade If Hisey Made"

Hisey

Established 1896
CINCINNATI, OHIO, U.S.A.

Electric DRILLS . . . GRINDERS . . . BUFFERS



Ex-Cell-O "Style 35" Thread Grinder

grinding wheel. The maximum diameter swing is 14¾ inches.

The machine will grind in both directions and will handle tapers up to 2 in. per foot. Grinding wheels may be trued without slowing down the wheel. The machine may be stopped at the end of each stroke or may be set to reverse automatically.

The machine is furnished with the standard wheel dresser, which provides for grinding of U. S. Standard, sharp V, 29 deg. Acme, and modified buttress threads. A universal dresser which, in addition, provides for using Whitworth and special threads, and back-off and internal grinding attachments are available at extra cost.

Lead compensation is provided to insure grinding accuracies. Where even greater accuracies are desired, a temperature control system for the coolant is available on the machine. This system includes an oil cooler of tubular construction enclosed in a sheet metal housing mounted adjacent to the large external coolant sump at the rear of the machine. Cooling water flow is regu-

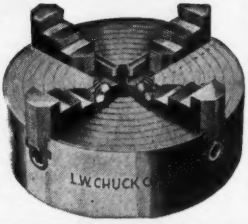
BEST VALUES ON THE MARKET

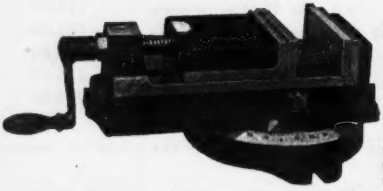
4-JAW INDEPENDENT LATHE CHUCKS

L-W Lathe Chucks are built with semi-steel construction and heavily ribbed body to withstand unusual strains. Four independent jaws made of accurately ground and fitted hardened steel are reversible and have 1¼" tough nickel steel screws. Best material and workmanship guarantee satisfactory service.

Now Made in 5 Sizes

10"	$27.00
12"	31.00
14"	36.00
16"	45.00
18"	58.50





SWIVEL MILLING MACHINE VISES

Large, Semi-Steel, 35 lbs. Made in Two Sizes. This large semi-steel vise which can be used plain or swivel is suitable for milling machine, drill press or shaper. Has sturdy 6½" steel jaws; key slots provide for attaching to machine table holding surface and jaws at right angles or parallel to table. Shipping weight 90 pounds.

6½" size.....$27.00
4½" size.....$19.50

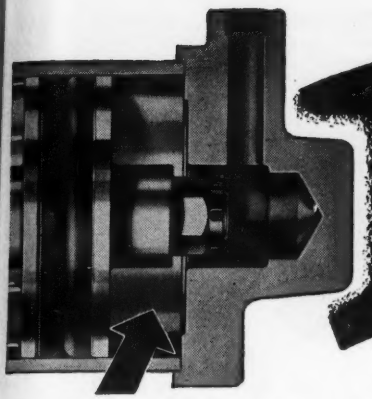
L-W also manufactures Magnetic Chucks, Demagnetizers, Dividing Heads and Power Hack Saws.

Send for a catalog of the complete L-W line.

L-W CHUCK CO.

20 N. ST. CLAIR ST. **TOLEDO, OHIO**

INVESTIGATE THE "L-W" LINE



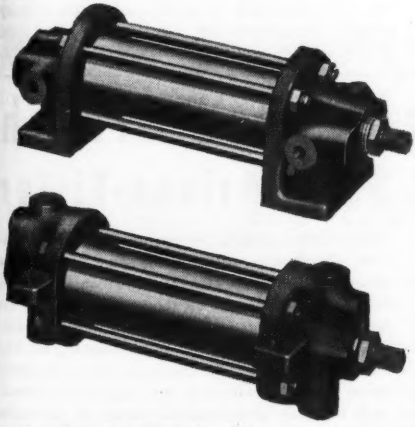
Now, a Complete Line of

CUSHIONED AIR CYLINDERS

in the "No-Cushion" Price Range

AIR CUSHION

Stops Metal-to-Metal Impact in All Nopak Cylinders



For Complete Details of the New NOPAK *Cushioned* Air Cylinders write for Illustrated Bulletin.

● Score another "first" for NOPAK! Now all NOPAK AIR CYLINDERS are CUSHIONED . . . with either adjustable or non-adjustable cushion heads.

NOPAK Air Cylinders with non-adjustable, positive, pneumatic cushion-stop sell in the same price range as non-cushioned cylinders. Noisy, damaging, metal-to-metal impact is eliminated, cylinder life prolonged. This means lower maintenance costs, smoother, more efficient performance for all air-operated equipment.

NOPAK Adjustable-Cushion Cylinders permit positive control of the exact degree of cushioning desired at the end of the piston stroke.

NOPAK Special Composition Cup Packing and extra-wide piston bearing protect cups from excessive wear and friction.

Companion Products to NOPAK Control Valves for Air, Oil and Water.

GALLAND-HENNING MFG. CO.

2758 S. 31st STREET
MILWAUKEE • WIS.

NOPAK VALVES and CYLINDERS

A 2392-1P

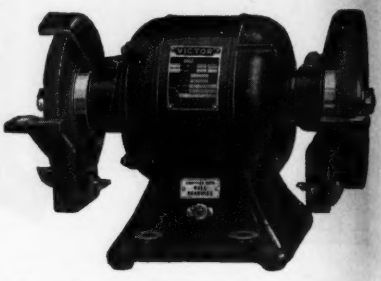
lated through a needle valve. With this cooler, temperature rise in the work can be reduced through lower coolant temperatures.

A. C. motors are regularly furnished with the thread grinder, but D.C. motors and rheostats are available as special equipment. A set of two-step interchangeable wheel and motor spindle pulleys are provided for maintaining the correct grinding speed as the wheel wears down from 18 to 13-in. diameter. By the means of these pulleys the optimum desired grinding speed can be maintained within three per cent regardless of the amount of wheel diameter already used up. Wheel speeds ranging from 1900 to 2640 r.p.m. are available on the new model, which is referred to as "Style 35", size 8x36x48.

Type No. 66 Stanley "Victor" Bench Grinder

A bench grinder particularly suited for general grinding, tool sharpening, buffing, polishing and wire brush work has been announced by the Stanley Electric Tool Division, The Stanley Works, New Britain, Conn. The grinder, to be known as the No. 66 "Victor" Bench Grinder, is powered by a ¼ h.p. motor, is full ball bearing, and has 6-in. wheels.

The no load speed at 60 cycles is 3560 r.p.m. and the full load speed is 3450



Type No. 66 Stanley "Victor" Bench Grinder

r.p.m. The wheels are 6x½ in. with ½-in. arbor hole. The length of the grinder is 14¼ in. and the size of the base is 7¼x8 in. Net weight, 41 pounds.

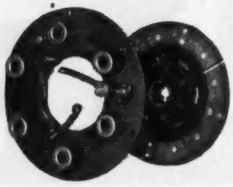
Finished in gray enamel, the No. 66 "Victor" Grinder is equipped with sturdy wheel guards, tool rests, toggle type switch, three-wire rubber-covered cable,

Rockford Spring-Loaded Clutch Suits Ariens-Tiller

Ariens-Tillers combine, in one machine, the operations of plowing, discing, and harrowing. The manufacturer's bulletin states: "Ariens-Tillers are built to stand hard and continuous service, only the best materials and workmanship go into their construction." In the Model A, illustrated, an 8½" Rockford Spring-Loaded Clutch transmits and controls motor power. Selected as most suitable in general, and for their close-coupled feature in particular, "Rockford Clutches have proved very satisfactory in Ariens-Tillers. They give us the smooth engagement and the load carrying capacity required in our unit and we are entirely satisfied in having selected this clutch for our machine."

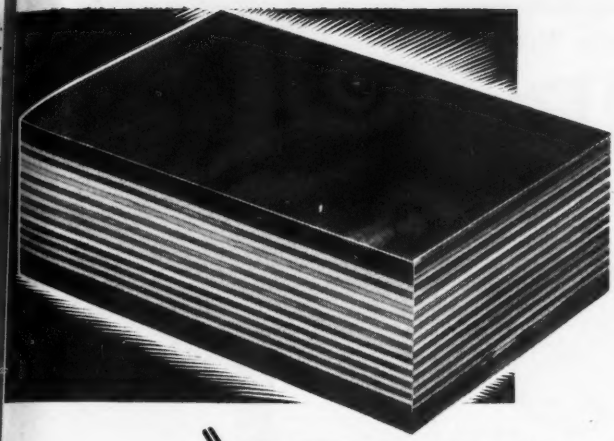
Pullmore Clutches

Made in single and double types; Pullmore Clutches are unexcelled for applications requiring a compact, powerful multiple disc clutch.



Rockford Clutches are made with single or double drive plates, in sizes from 6" to 20", for transmitting 2 h.p. to 80 h.p. at 100 r.p.m. Write today for complete information.

Rockford Drilling Machine Division
of Borg-Warner Corporation
300 Catherine Street, Rockford, Illinois



"PREGWOOD"

A NEW FORMICA PRODUCT-

Light and Strong for Mechanical Uses

Thin laminations of wood impregnated with phenolic resins and vulcanized into a hard homogeneous sheet are offered by Formica in a new product which is remarkable for its lightness and strength and ability to hold its dimensions under extreme conditions . . . "Pregwood" is lighter than aluminum (specific gravity 1.35) and has a flexural strength of 25,000 to 30,000 lbs. per square inch. It is highly resistant to moisture absorption and has a low co-efficient of thermal expansion . . . This material is offered in sheets of a minimum thickness of ¼ of an inch, and 20 inches wide by 96 inches long. It is a light, strong, stable material that should have many uses. Samples on request.

The Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.

FORMICA

Let us hand you these

UNBRAKO

SOCKET SCREWS

So many men who have actually held these "Unbrako" Socket Screws in their hands have told us "YOU CAN UNDERSTAND BY JUST EXAMINING THEM THAT THEY ARE TOPS IN QUALITY", that we want you, too, to see for yourself that that statement is not an exaggeration. The fine machining, the sleek, dull black finish, the perfect balance and accurate threading are obvious quality indications.

Fig. 232 "Unbrako" Hollow Set Screw

Fig. 1636 "Unbrako" Self-Locking Dog Point Set Screw Pat'd.

Any tests you care to give them will show you that "Unbrakos" are unbelievably strong. You'll want to use them from then on. Write us and we'll send you samples as well as full information about the complete line.

Fig. 1434 Knurled "Unbrako" Socket Head Cap Screw U.S. and Foreign Pats. Pending

STANDARD PRESSED STEEL CO.

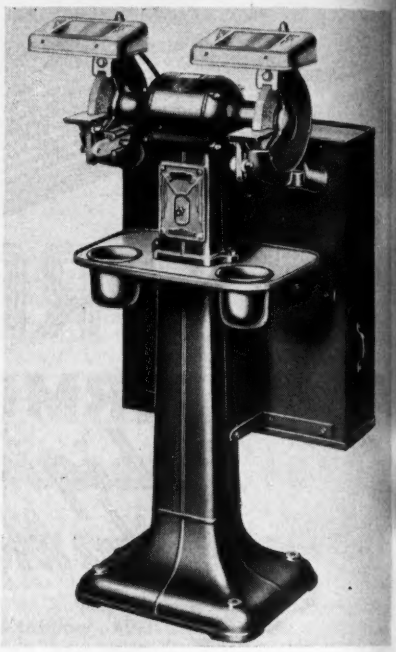
JENKINTOWN, PENNA.

Boston Detroit Indianapolis Box 556 Chicago St. Louis San Francisco

rubber feet, and one coarse and one fine grinding wheel.

Delta Self-Contained Dust Removal Cabinet

To meet the necessity for keeping the air clear of dust occasioned by tool grinding in shops where there is no dust



Delta Self-Contained Dust Removal Cabinet As Applied to a Delta Tool Grinder

removal or blower system, the Delta Mfg. Co., 695 E. Vienna Ave., Milwaukee, Wis., has developed a self-contained dust removal cabinet which can be attached to any Delta pedestal grinder. The cabinet contains dust filters which trap practically all of the fine dust carried down the discharge chutes of the grinder and prevent it from being carried into the air. The cabinet is also fitted with baffles which project all of the heavy particles into the cabinet base where the dust may easily be removed.

The unit requires no power, and since it is completely self-contained, the grinder to which it is fitted may be used anywhere in the shop. The dust

WE BORED THEM!

• Modern foundry methods—exacting physical and metallurgical requirements—accurate machining and rigid inspection produce in Buckeye Bushings a quality product capable of giving a maximum of satisfactory and trouble-free service. That's why hundreds of companies specify—and insist on getting—Buckeye Bushings. • Send for the Buckeye Catalogs. Then, like other manufacturers, you too can order Buckeye Bushings—from stock—from the eighteen warehouses located at strategic points from coast-to-coast. No obligation. Send for the catalogs today!

No order is too big or too small for Buckeye

SEND FOR THE BUCKEYE CATALOGS

Catalog 137 lists 787 sizes of ready-to-use industrial bushings and 154 sizes of cored and solid bars.

Catalog "O" lists 268 sizes of Electric Motor Bearings.

Sent on request. Write today.

Write Cleveland direct on blue print and specification requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

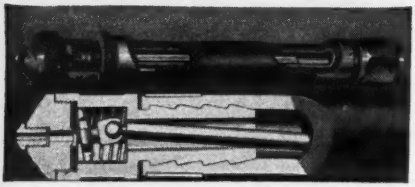
BRONZESMITHS SINCE 1900

412 HAWTHORNE AVE. CLEVELAND, OHIO

removal cabinet is said to be remarkably efficient in action and reduces dust hazards incidental to tool grinder operations to a considerable extent.

Air-O-Chek Valve Unit

An Air-O-Chek Valve Unit that screws on to the hose has been announced by the Air-Way Pump & Equipment Co.,



Air-O-Chek Valve Unit

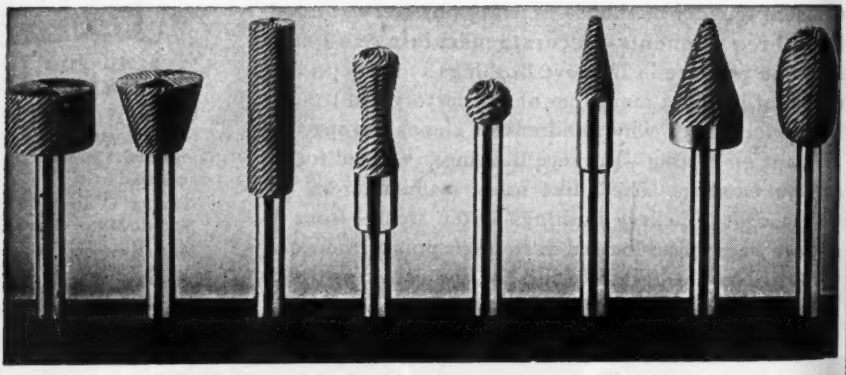
625 W. Jackson Blvd., Chicago, Ill. The valve was developed for use in machine shops, furniture factories, textile mills, aircraft and automobile factories, steel mills, foundries, and other industries where compressed air is used for blowing.

The valve employs the unique Air-O-Chek ball and socket joint with enclosed actuating lever which eliminates protruding buttons or levers, as well as packing glands. All operating parts are shielded within the valve and air hose. A slight pressure between thumb and finger to flex the hose provides a large free-flowing volume of air with instant, positive shut-off when the hose is released. The valve is furnished with either male or female fitting for conveniently attaching to and removing from the hose and is made of bar brass and stainless steel for ⅛, 3/16 and ¼-in. hose. A variety of nozzles is available for different types of work.

Norton Microliner

The illustration shows the Norton Microliner, which has been placed on the market by Norton Company, Worcester, Mass. The instrument is designed for ensuring the straightness of the V-way on the bases of long Norton grinders. Not only is the device used in the construction of machines so that the ways may be scraped perfectly straight, but it is said to be equally useful to customers when setting up machines on foundations in duplicating the original accuracy of alignment and

FORD HAND CUT ROTARY FILES

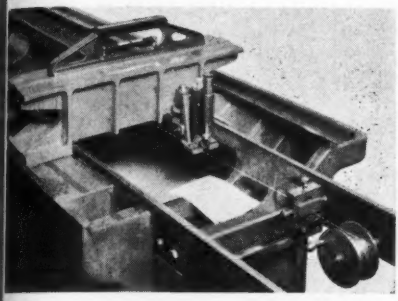


Just a few of the many standard shapes which are carried in stock.
Write for full information.

408 PERSHING AVE. M. A. FORD MFG. CO. DAVENPORT, IOWA

for checking alignment from time to time.

The equipment consists chiefly of a bridge of cast iron planed and scraped to correspond with the flat V-base ways,



Norton Microliner

a microscope mounted on the bridge, a coil of music wire, and clamps for holding the wire in position. The microscope has an accurate scale graduated in thousandths of an inch across the optical field which is illuminated by a dry cell operated lamp built into the instrument.

The music wire of 0.010-in. diameter is stretched tightly from end to end of the base in a position so that readings of the microscope are alike at both ends. The bridge is then moved along the ways and readings are taken every two or three feet, all readings being made from the same side of the wire. A sheet of white paper placed under the wire directly below the microscope will aid considerably in making readings. From the chart of readings, corrections in alignment can be made by means of the base adjusting screws.

The bridge is also planed and scraped on its top surface for using a precision level in testing parallelism of the V and flat way.

Two Natco "Station Type" Multi-Drillers and Multi-Tappers for Cylinder Head Work

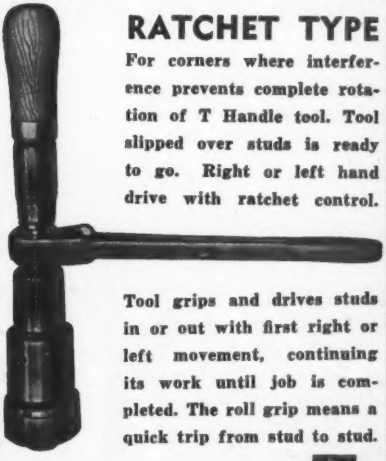
Two Natco Station-Type Combination Multi-Drillers and Tappers, representing the most advanced methods of handling automotive production, have been brought out by National Automatic Tool Co., Richmond, Ind. One operator is required for each machine, and each

NOW! Set Studs The Roll Grip Way

TITAN STUD SETTER "T" TYPE TOOL

Will Drive Studs or Remove Them

Placed over stud to be set or removed. Slight left or right hand turn effects tight grip on stud. Release is just a matter of reversal accomplished in a split second.



RATCHET TYPE

For corners where interference prevents complete rotation of T Handle tool. Tool slipped over studs is ready to go. Right or left hand drive with ratchet control.

Tool grips and drives studs in or out with first right or left movement, continuing its work until job is completed. The roll grip means a quick trip from stud to stud.

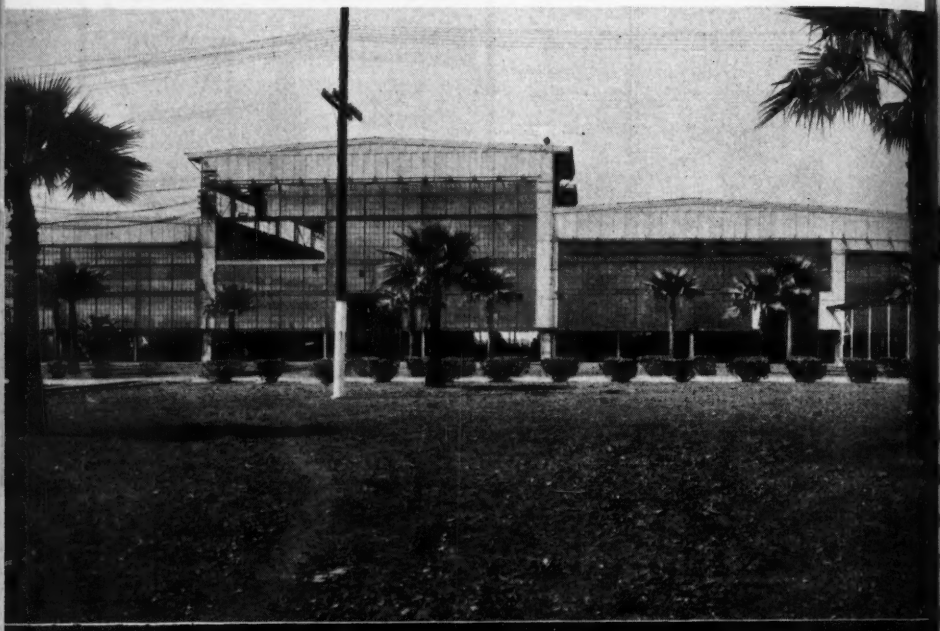
The TITAN drives studs by gripping unthreaded body of stud. It drives studs having as little as ½" of gripping surface. Used as a POWER TOOL it may be driven by electric, air, or machine tool equipment. Write for details.

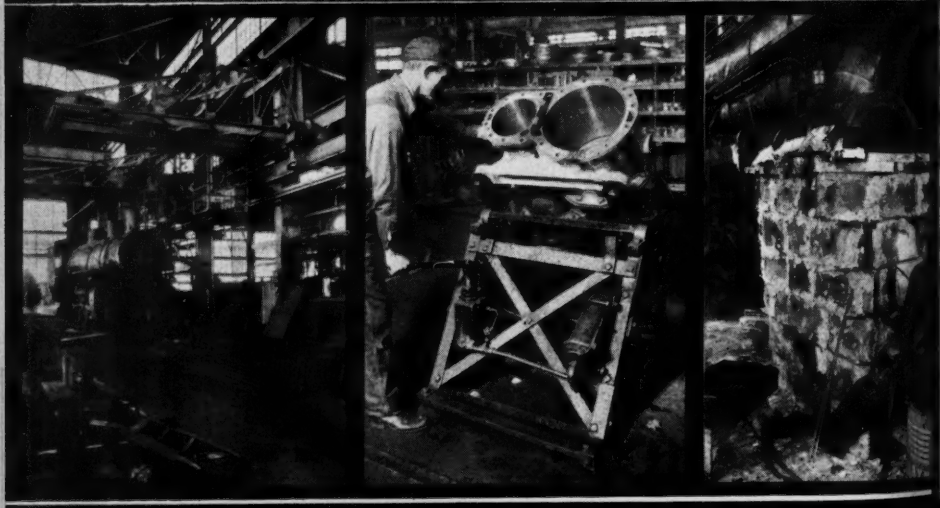
Manufactured under the Kirkland Patent No. 2069527.

TITAN TOOL COMPANY

FAIRVIEW ● PA.

NOT ONE MACHINE SH(E
WILL EVER SEE THESE A. R.





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SH(ECUTIVE IN A THOUSAND A. R. R. SHOPS IN TAMPA...

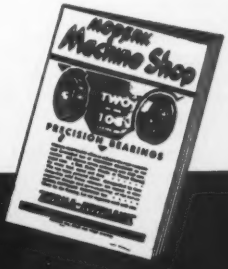
Except through the eyes of MODERN MACHINE SHOP'S *editor!*

FOR thousands of mechanical executives the prospect of personally visiting and studying the operating methods of leading metal-working plants throughout the United States is extremely remote.

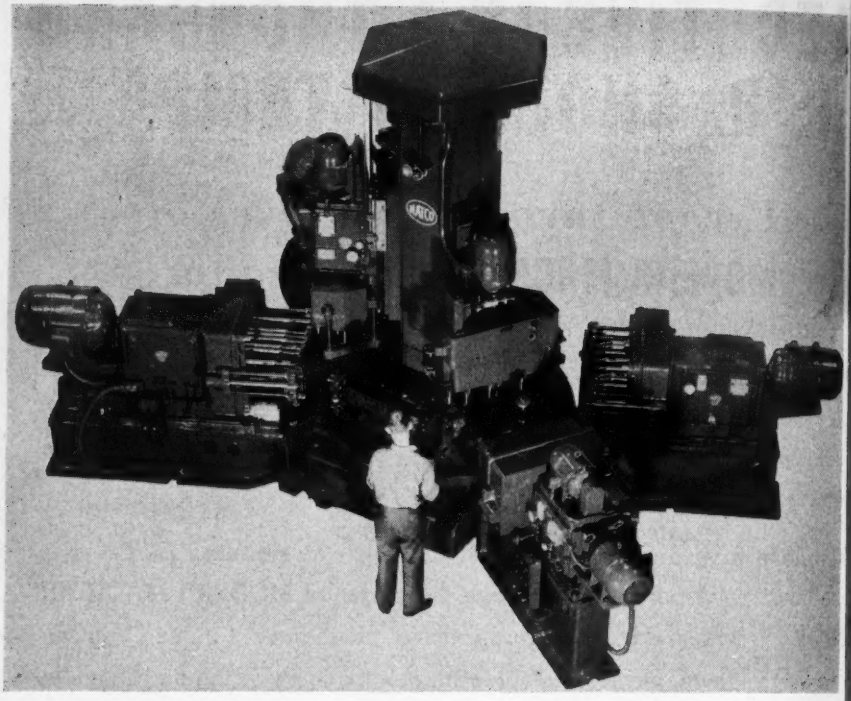
Yet these thousands of executives **can** visit outstanding plants and see how they operate . . . **through the pages of MODERN MACHINE SHOP** . . . whose editors annually travel thousands of miles to obtain exclusive views and stories of leading shops in even the most remote parts of the country.

Add to these exclusive monthly plant tours articles by prominent authorities covering every phase of operation, production and maintenance in the metal-working plants . . . features of practical value such as "Ideas from Readers", "New Shop Equipment" Reviews . . . the largest volume of advertising information carried by any monthly metal-working magazine, and it's easy to see why alert mechanical executives are anxious to receive their monthly copies of MODERN MACHINE SHOP.

Clear, concise, authoritative information for alert mechanical executives.



DERN MACHINE SHOP



Natco Station-Type Combination Multi-Driller and Tapper for Cylinder Head Work.

maintains a production rate of 90 cylinder heads per hour . . . a total of 154 operations every 40 seconds.

The Natco station type machine is built of a steel column and base, four horizontal Natco Holeunits, three vertical Natco Holeunits, and one vertical Natco reversing motor drive individual lead screw tapping unit. The four horizontal Holeunits are arranged with spindle boxes containing a total of 19 anti-friction bearing-mounted spindles complete with nose adjustment. The three vertical Holeunits are arranged with spindle boxes containing a total of 42 spindles of similar construction. The tapping unit has a spindle box containing eight tapping spindles complete with lead screws and tap holders.

The cylinder heads are held in six identical stationary type fixtures which are mounted around the six position, 66-inch diameter, automatic mechanical indexing rotating table. As the cylinder heads are indexed from one position to another, a total of 79 operations are performed, as follows:

Position No. 1—Remove and load one part. Position No. 2—Vertical head; form core drill 3 port holes. Horizontal head; drill 11 bolt holes.

Position No. 3—Vertical head; drill 8 holes. Horizontal head; combination ream and chamfer 2 bolt holes, and drill 5 bolt holes. Position No. 4—Idle. Position No. 5—Vertical head; chamfer 8 holes. Horizontal head; drill 16 water holes. Position No. 6—Vertical head; tap 8 holes. Horizontal head; combination drill and ream 8 water holes.

Weight of machine, 60,100 pounds.

The Natco station type machine, illustrated herewith, is built of a steel column and base, four horizontal Holeunits, one horizontal Natco reversing motor drive individual lead screw tapping unit, two vertical Natco Holeunits, and one vertical Natco reversing motor drive individual lead screw tapping unit. The six Holeunits are arranged with spindle boxes containing a total of 67 anti-friction bearing-mounted spindles complete with nose adjustment. The

INITIAL SAVING $235

CONTINUAL SAVING . . .

on production time by performing several operations at once.

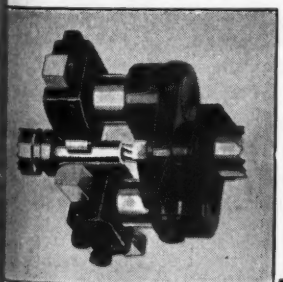
INITIAL SAVING $235

You pay $300.00 for an assortment of right and left hand tools . . . You pay $65.00 for one R & L Turning Tool that will produce the same amount of work . . . You save $235.00!

CONTINUAL SAVING

Here are a few of the multiple operations performed by the R & L Turning Tool: Turns two diameters while drilling or reaming - Turns and centers - Drills and chamfers - Roughs and finishes cuts, right or left hand.

Turning and Centering.

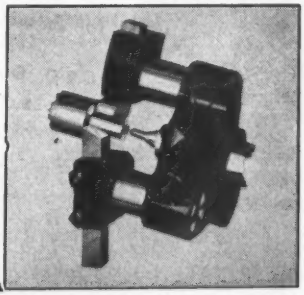


WRITE FOR CATALOG

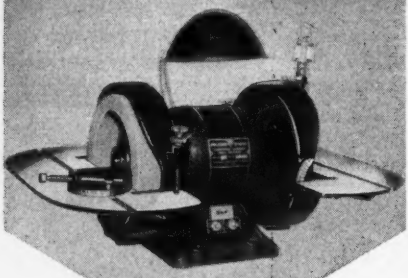
R & L TOOLS

1825 BRISTOL STREET
NICETOWN,
PHILADELPHIA, PA.

Turning one diameter—chamfering two corners, facing end of part while drilling or reaming.



PROSSER
Cemented Carbide Tool Grinder



$97.50 COMPLETE

Don't take our word for it that this grinder will increase the life of your tools and reduce tool breakage—Try it out for ten days and convince yourself.

This grinder removes metal fast when rough grinding and finish grinds smooth, keen cutting edges.

Write for details.

10 DAYS FREE TRIAL

Thomas Prosser & Son
120 WALL ST. • NEW YORK

two Natco reversing motor drive tapping units are arranged with spindle boxes containing a total of 13 tapping spindles complete with individual lead screws and tap holders.

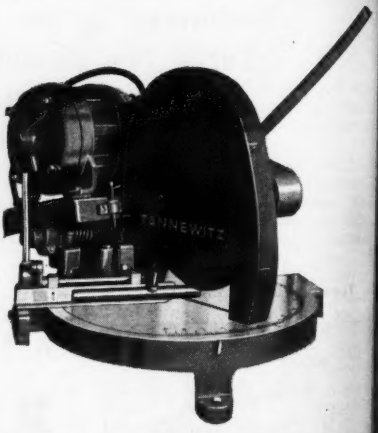
As in the other station type Natco, the cylinder heads are held in six identical stationary type fixtures. These fixtures are mounted around the 66-inch diameter six-position automatic mechanical indexing rotating table. As the cylinder heads are indexed from one position to another, a total of 75 operations are performed, as follows:

Position No. 1—Remove and load one part. Position No. 2—Vertical head; drill 6 holes. Horizontal head; drill 12 holes. Position No. 3 — Vertical head; countersink 6 holes. Horizontal head; drill 19 holes. Position No. 4 — Idle. Position No. 5. — Vertical head; idle. Horizontal head; countersink 6 holes, spotface 8 holes, drill 5 holes. Position No. 6—Vertical head; tap 6 holes. Horizontal head; tap 7 holes.

Weight of machine, 62,100 pounds.

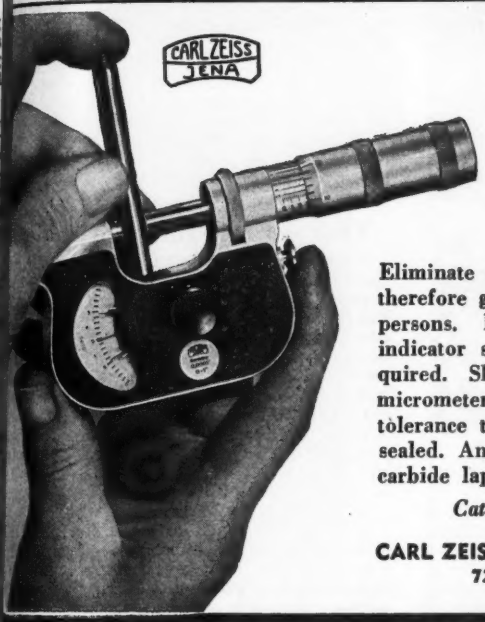
Tannewitz Type M Abrasive Cut-Off Machine

Metal can be cut quickly, accurately and at low cost with the Tannewitz Type M Abrasive Cut-Off Machine illustrated herewith. This machine, product of The Tannewitz Works, Grand Rapids, Mich., cuts dry, no water being employed.



Tannewitz Type M Abrasive Cut-Off Machine

The machine is easily and quickly adjusted for all sizes of stock within its capacity. It can be swivelled instantly



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Indicating MICROMETERS

Eliminate variation due to individual touch, therefore give identical readings by different persons. Deviation conveniently read from indicator scale to .0001 in. No ratchet required. Sleeve graduations same as in plain micrometers. Adjustable limit marks permit tolerance to be easily kept. Setting can be sealed. Anvil and spindle faced with tungsten carbide lapped plane and parallel.

Catalog Fe 102 upon request.

CARL ZEISS, INC., 485 Fifth Ave., New York
728 So. Hill St., Los Angeles

COSTS GO DOWN

BECAUSE *Mac-its* STAND UP!

Running into production delays because of screws that break, strip or split? Looking for lower costs on particularly tough fastening jobs? Then call in your Mac-it man for supreme, uniform quality, and the only complete line of heat-treated, alloy steel screws on the market!

Sixteen standard items comprise Mac-it's complete line. Standardize on Mac-its for undivided responsibility in solving your problems.

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1392 WEST THIRD ST., CLEVELAND, OHIO

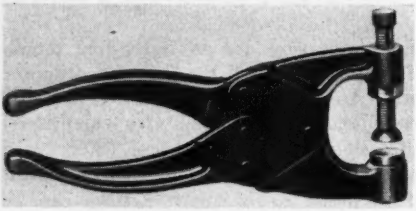
Mac-its PRONOUNCED "MACKITS"

THE ONLY COMPLETE LINE OF HEAT-TREATED, ALLOY SCREWS

to cut any angle from 46 deg. right to 45 deg. left. Work is securely clamped by a quick-acting toggle hold-down.

Knu-Lok Rapid Action Toggle Pliers

With the Knu-Lok Rapid Action Toggle Pliers now being made by Knu-Vise Products Company, 6432 Cass Ave., Detroit, Mich., rivets can be held for cold heading, tubing can be held for bell mouthing, dutch bends can be formed on metal parts, two pieces of material can be clamped together for processing, and many other parts can be held or clamped where quick adjustment, automatic lock, and instant release are important factors.



Knu-Lok Rapid Action Toggle Pliers

The pliers are made from high grade alloy steel, hardened. A knurled adjusting screw provides for quick adjustment to handle various thicknesses of work. The Model No. 460, shown here, is 6½ in. overall, has a 1⅜-in. maximum opening, and weighs ½ pound.

Thor Portable Electric Grinders

Three portable electric grinders manufactured in 4, 5 and 6-in. diameter wheel capacities have been announced by the Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Ill. The company states that the grinders, because of a newly perfected method of vibration control are practical to use even on production work where constant severe service is required. A simple change in the basic design of the spindle—substituting resilient steel strips for a single solid piece—provides this control of vibration from the wheel.

The spindle is a two-piece shaft, joined with resilient steel strips. It absorbs and stops all vibration before it reaches the motor. The steel strips, not the motor, take the shocks and prevent lead

For a Better Grip on Screw Machine Profits

Be sure your reference file of screw machine accessories includes the complete Sutton Catalog listing DIAMOND-GRIP Collets and Sutton Feed Fingers for all machines. Your request brings a copy by return mail.

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TRICO AUTOMATIC OILERS

MODERNIZE EQUIPMENT

The **OPTO-MATIC** maintains a constant level of oil in ring or ball bearings by feeding oil when the level drops and automatically shutting off when the correct level has been restored. Equipped with concealed level adjustment. 100% foolproof.

The **LEVOMATIC** is also a constant level oiler, simple, inexpensive, economical. Especially designed for low cost application on small motors, pumps, etc.

The **DRIP-DROP** is a thermal bottle oiler dropping oil on the bearing from the top exactly as needed.

Have new machinery factory-equipped with TRICO OILERS.

TRICO FUSE MFG. CO.
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"STACKBINS MAKE A STOCK HANDLING SYSTEM THAT CAN'T BE BEATEN"

. . says large X-Ray equipment manufacturer

The combination of portable steel STACKBINS and simple records provides a stock-handling system which offers the utmost in convenience, simplicity and efficiency—the loss of expensive X-ray parts is practically eliminated. This manufacturer's savings are typical of those enjoyed by hundreds of STACKBIN users.

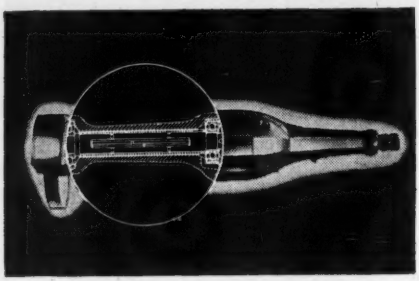
STACKBIN sections are sturdy welded sections containing 2 to 6 compartments so constructed that they nest firmly into one another. The full-view hopper fronts keep contents from spilling and within easy reach. Smooth interiors speed up handling.

Whatever your storage or active stock problems may be, you'll find STACKBINS worth your investigation. Write today for complete STACKBIN literature giving full details and many useful ideas. Stackbin Corp., 53 Troy St., Providence, R. I.

**Name on request.*

STACKBINS
"STACKED AND STILL ACCESSIBLE"

wires to the commutator from crystallizing and breaking. Motor burnouts, with their resultant production delays



Thor Portable Electric Grinder

and repair costs, are avoided.

The streamlined design, light weight and compact construction of Thor grinders provide easy handling wherever the job may be. The 4-in. grinder, known as the Thor U54, is recommended for fast grinding on light jobs. It weighs 10 lbs., is 19 in. long and operates at a free speed of 6000 r.p.m. The 5-in. grinder, called the Thor U55, operates at a slower speed for heavier duty work. It weighs 10¼ lbs., is 19½ in. long and runs at a free speed of 4500 r.p.m. The 6-in grinder, Thor U60, is designed for the very hardest kind of grinding jobs. It weighs 20 lbs., is 24½ in. long and has a 6000 r.p.m. free speed.

Acme High Speed Six-Spindle Semi-Automatic Coupling Tapper

A six-spindle, semi-automatic coupling tapper, with automatically air-operated chucks, has been announced to the trade by The Acme Machinery Company, 4537 St. Clair Ave., Cleveland, Ohio. The speed at which the machine taps couplings—at the rate of 1250 ¾-in. couplings per hour—is one of the distinctive features. Scroll air chucks, with which each spindle is provided, are automatically closed and opened with the downward movement of the spindles.

In operation, a coupling is placed in the chuck and the operator trips a small lever at the right of the spindle. The spindle then completes its cycle by valving the air to close the chuck, tapping the coupling, and again valving the air to open the chuck and allow the

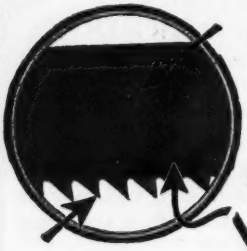
MARVEL

HIGH-SPEED EDGE HACK SAW BLADES

Tomorrow's Blades TODAY!

Thousands of users; in fact, everyone who knows cutting steels and tools recognizes that MARVEL High-Speed-Edge Hack Saw Blades are far-and-away the finest that **can be made—that there is no equal steel —that only the patented composite MARVEL** Blade can have this cutting edge and at the same time be positively unbreakable in fact. **Heavy duty high speed, automatic production** sawing machines have been made practical only because of MARVEL'S high speed and unbreakable qualities. The cutting edge is of 18% Tungsten High Speed Steel, welded by a special process to a tough alloy back. Thus they are made **positively unbreakable.**

Increase the efficiency of your shop—get higher running speeds and greater feed pressures, be assured of more cuts per dollar—turn to MARVEL High-Speed-Edge Hack Saw Blades!



3. Tough alloy back; positively unbreakable!

2. Integrally Fused by electric weld.

1. 18% High Speed Steel Cutting Edge.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

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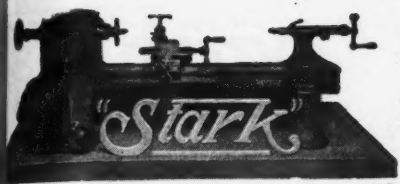
Eastern Sales Office: 199 Lafayette St., New York



NEW INTEGRAL DRIVE PRECISION BENCH LATHE

(Patented)

First tool of its class with built-in motor and speed-changing mechanism, entirely eliminating mill-wrighting. Nothing under bench—Nothing overhead. Drive integral with the lathe itself. Marvelous compactness, using little more space than other lathes. Any powerful vibrationless speed at a turn of the hand wheel in front. Belted and wired, ready to run. **Priced at only slightly more than other precision lathes** with separate, complicated drives. Two splendid sizes. (Colored Bulletin J). **Also Stark Standard Precision Lathes, 6 sizes, ¼" to 1¼" capacity and up to 12" swing; with complete equipment. Stark Spiral Bench Millers, the most accurate of their type.**

Stark Tool Co. ***Est. 1862*** **Waltham, Mass.**

Originators of the American Bench Lathe

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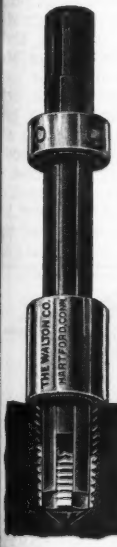

Merry Christmas

Such as only a set of

WALTON TAP EXTRACTORS

can bring. (They back out broken taps—no delay or damaged work).

Send for Folder 132 giving sizes, styles and prices.

Test their worth by 30-day Free Trial.

The Walton Co.

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NEW LUFKIN RADIUS GAGES

To meet the demand for radius gages with radii larger than ½", this new large size Lufkin set is now offered with radii from 9/16" to 1" by 16ths. Like all Lufkin Radius Gages, each blade is a separate unit, prominently marked with its individual radius, and carrying five applications of the internal and external forms. A sturdy leatherette folder is furnished with every set.

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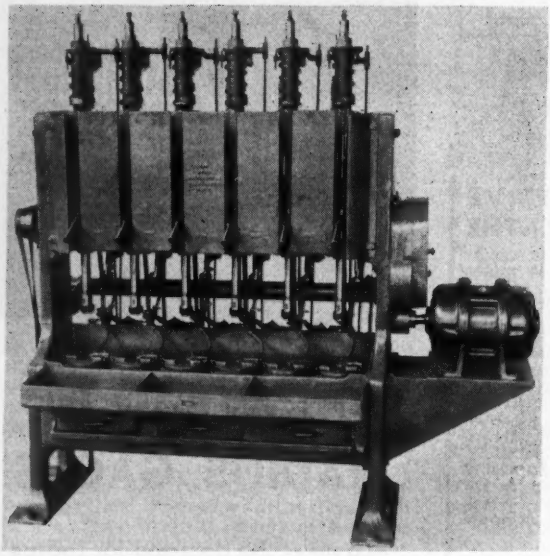


Acme High Speed Six-Spindle Semi-Automatic Coupling Tapper

spindle to return to its starting position through the power-actuated cams, with the coupling on the tap shank. In addition, the spindles are provided with oil check valves with a small bleeder valve which makes it possible to cushion the spindle the desired amount on its downward stroke.

Production has been greatly stepped up on these machines by using the quick-acting, automatically operated air chucks, which, together with the power-actuated vertical movements of the spindles, also eliminate all heavy manual operations as well as fatigue of the operator. The tapper has a work capacity range of from ⅛ to 1¼-in. standard pipe couplings and are motor driven.

No-Rust Liquid V-15

An improved anti-rust preparation recommended for protecting polished steel parts of machinery and tools against rust in storage and during shipment is now being marketed by the Frost Paint & Oil Corporation, 1209 Tyler Ave., N. E., Minneapolis, Minn., under the trade name "No-Rust Liquid V-15." The liquid is easily applied with a brush or spray gun, and requires no mixing or special preparation. It dries in 30 minutes, forming a tough, elastic, non-porous film which resists abrasion, moisture and salt air. The protective coating is readily removed by wiping with gasoline or kerosene when the machine is placed in service. Efficiency and ease of removal are said to be outstanding features of No-Rust Liquid V-15.

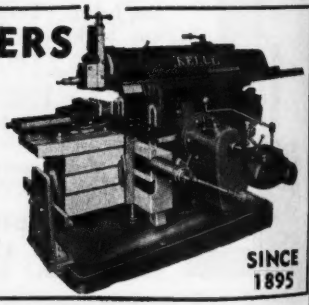
Landis Special Forming Head

The Landis Machine Company, Inc., Waynesboro, Pa., has recently designed a special forming head for use on their Automatic Forming and Threading Machine. Heretofore the forming head used on this machine merely faced and bevelled or "pointed" the end of the bolt or screw. This special head has two additional functions to perform. In addition to facing and bevelling the end of the work, the cutters which are used in this head are designed to reduce the body diameter of the work and face the

KELLY

CRANK SHAPERS
HEAVY DUTY

Made in six sizes from 16" to 36" stroke, with motor or single pulley drive. Timken Bearings throughout. Revolving Table. Semi-automatic pressure lubrication. Centralized control. Stroke and feed adjustment during operation. Thoroughly guarded to protect operator and machine. Attractive prices.
ONE- YEAR GUARANTEE



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Long Length Drills
Special Size Taps
Carried in Stock

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High speed and carbon drills, taps, reamers, milling cutters, hollow mills, end mills, drill rod, die sets, etc.

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Control your air pressure with Norgren Regulating and Reducing Valves. They represent the most important advance in regulator design in a quarter century and assure your air tools' ability for precision work. They are also suitable for steam, oil, water and non-corrosive gas applications.

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Ball-bearing users—COMTORPLUG leads to better housings, lowered costs.

"Tolerances cut in half, cost of housing bearings reduced," say users.

When machine operators are equipped with Comtorplug instead of solid plug gages, they send along better bores to the assemblers. Tolerances are reduced, bearings fit better, assembly is speeded. This unique gage makes every man an expert gager, measuring automatically to split ten-thousandths, readily detecting out-of-round, front or back taper, barrel shape, etc.

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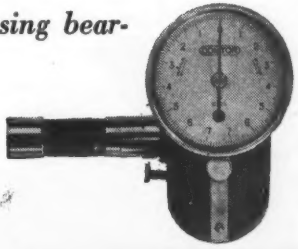
Est. 1928 Waltham, Mass.



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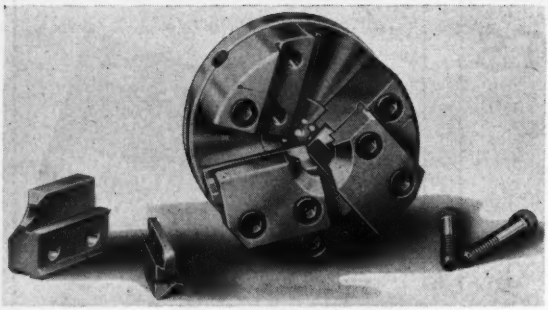
Self-aligning, self-centering, automatic 2-point gaging. For production gaging, easily readable to fractional tenths.

"Brings Laboratory Accuracy to Routine Gaging."



Landis Special Forming Head

shoulder at the end of the cut.

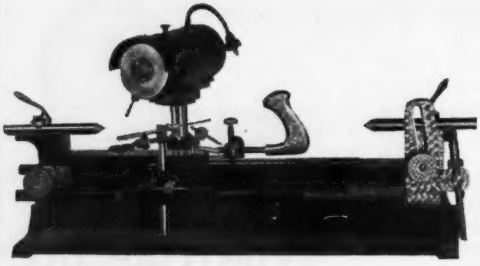
In order to reduce the strain on the head, the cutting load is distributed over three cutters. The cutters are located and securely lodged in the correct cutting position by a setting gage and a clamping action similar to that which is employed for the Landis Tangential Chaser. Provision is also made for the independent adjustment of each cutter holder so that a uniformity of cut is assured for each cutting tool. The forming head body and the cutting tool holders are made of alloy steel which has been heat treated to insure maximum wearing qualities.

Tungsten Carbide Centerless Grinder Work Support Blade

Work support blades of tungsten carbide are now available for use on Cincinnati Centerless Grinding Machines, product of Cincinnati Grinders Inc., Cincinnati, Ohio. The blades are generally suitable for use in centerless grinding of material ⅛-in. diameter and larger, but their use is not recommended for work smaller than ⅛-in. diameter.

Performance records show that these blades have excellent wear-resistant qualities, lasting seven to ten times longer than ordinary blades. They have less tendency to score or scratch the work. An interesting example of the performance of this work support blade is found in the record of a job involving the grinding of anti-friction bear-

. . . You've waited years for this NEW "Time-Saver" Tool Grinder



Sharpens all types of Cutters, Reamers, Taps, End Mills, Hobs, etc.

Sharpens BETTER BY grinding the relief straight from the cutting edge.

Much faster and easier to set up and operate than heavy production grinders and does as good or better work.

Low in cost—any shop having tools to sharpen can afford a "Time-Saver". Increases service from tools 3 to 5 times. Compact—fits into any out-of-the-way space in shop or tool room.

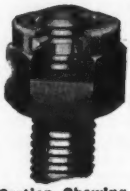
Write for prices and complete information.

PRECISION ENGINEERING & MFG. CO.
NEW PHILADELPHIA • OHIO

Machinery operates more efficiently when held **tight** with

UNSHAKO

The Nut that can't shake loose



Pat'd. and Pat's. Pending

Fig. 1510

Cutout Section Showing Locking Ring in Place.

Almost any machine, when properly tightened-up, operates longer and more efficiently. "Unshako" will keep it that way. Whenever vibration starts to loosen that nut, a built-in locking ring springs to life and grips the bolt. Yet it's easily removed with a wrench . . . can be re-used. Write for literature.

STANDARD PRESSED STEEL CO.

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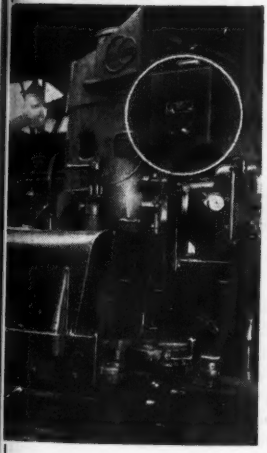

NEU-T-ROL saves loss of time . . prevents damaging, scoring and marring of work and magnetic chuck . . . prevents bruised knuckles . . by releasing work completely and demagnetizing it. Available for all sizes of magnetic chucks . . easily installed as it replaces existing switch and connects to same D. C. wires.

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DIE-CAST metals and aluminum alloys are extremely sensitive to harsh alkaline cleaning solutions. Etching, tarnish and loss of weight occur unless the CORRECT cleaning material is used when removing oil and grease from processing operations.

Avoid loss, damage to products, rejects and other troubles by using SAFE Oakite cleaning materials, scientifically developed to remove oil, grease and dirt quickly, economically from sensitive alloy metals WITHOUT HARMING SURFACES! Tell us your problems . . . we can help. Won't you write today?

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SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

ing races. The races were of Ni Molly steel with a 59-63 Rockwell C hardness. Removing a total of 0.018 in. of stock, 134,093 races were finish ground before it became necessary to regrind the work support blade. This particular blade,

Tungsten Carbide Centerless Grinder Work Support Blade

illustrated herewith, is 42 in. long and surfaced with tungsten carbide. On another job where a similar work support blade was used, 90,000 piston pins were finished, passing through the machine four times each before the blade was reground. Previous blades were reground after 20,000 pieces had been finished.

Tungsten Carbide Work Support Blades are supplied as follows: (1) Standard Thru Feed Work Support Blades for Nos. 2 and 3 Centerless Grinders. (2) Low Thru Feed Work Support Blades for Nos. 2 and 3 Centerless. (3) Heavy Duty Thru Feed Work Support Blades for Nos. 3 and 4 Centerless. (4) Standard Infeed and Roller Infeed Work Support Blades for No. 2 Centerless and Roller Infeed Blades for No. 3 Centerless. (5) Standard Infeed Work Support Blades for Nos. 3 and 4 Centerless. (6) Long Bar Attachment Work Support Blades for No. 2 Centerless. (7) Long Bar Attachment Work Support Blades for No. 3 Centerless. (8) Race Grinding Work Support Blades for No. 2 Centerless. (9) 4 to 9-in. Power Race Grinding Work Support Blades for Nos. 3 and 4 Centerless. (10) 2 to 6-in. Race Grinding Work Support Blades for Nos. 3 and 4 Centerless. (11) Long Fibre Tube and Rod Fixture Work Support Blades for No. 2 Centerless.

Dumore "Tom Thumb" Precision Grinder

A tool post grinder small enough for the bench lathe, yet rugged enough for heavy work, appropriately named the "Tom Thumb", has been brought out by

Are Your Machines Running Blind?

A punch press or any production machine running without a counter is as good as blindfolded. The counter dials are the eyes of the machine, telling the operator every second just where he is. *Productimeters* save losses from over runs, under runs and time wasted in hand counting.

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LAPPED & POLISHED DIAMOND BORING and TURNING TOOLS

"V" Point

Offset

• For boring and turning all non-ferrous metals, bakelite, hard rubber, etc. Strong and keen cutting. Guaranteed to perform satisfactorily.

Write for prices and recommendations

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BALCRANK

① MACHINED FROM SOLID BAR STEEL.
② SUPER SMOOTH POLISHED FINISH.
③ CLOSE TOLERANCE—ACCURATE BALANCE.
④ PRICED BELOW YOUR PRESENT COST.
⑤ COMPLETE STOCK ALWAYS AVAILABLE.
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Mill over 1,000 Parts per Hour!

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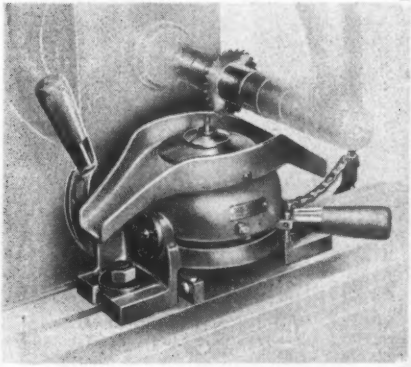
NEW DEARBORN AUTOMATIC CHUCKING AND INDEXING FIXTURE

For Milling Machines. Features: 1. Work held by draw in collets. 2. Collets open and close automatically. 3. Work automatically ejected. 4. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. 5. Minimum set-up time required. 6. Speeds up production—over 1,000 parts can be milled per hour. Positive and accurate in operation.



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The Dumore Company, Dept. 188-L, Racine, Wis. Like its bigger, heavier brothers, the Tom Thumb was precision built for precision use and is intended for internal and external grinding for accuracy to a ten-thousandth.

The grinder is powered by a plain series universal 1/14 h.p. motor designed for forced ventilation. Wheels of ⅛ to 2-in. diameter are used, operating at 8500 to 19,000 r.p.m. Motor bearings are of the plain sleeve type, with single-

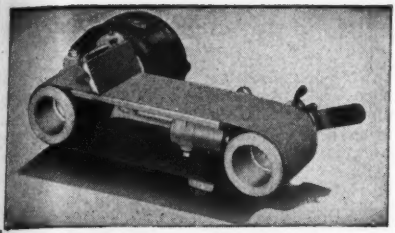
Dumore "Tom Thumb" Precision Grinder

row ball bearings for the spindle. The quill is built integral with the frame. Lubrication is by means of a felt tube and wick.

The center distance from the spindle to the base is 1½ in. and from spindle center to tool post, ⅞ in. Weight, net, 6¼ lbs. Equipment includes one belt, one double end wrench, one grinding wheel, and one Dumore oil can.

PRESSES
FEEDS
AUTOMATIC
EQUIPMENT

THE V & O Press Co.
HUDSON N Y



• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with **ALEMITE LUBRICATION** complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER

WALLS SALES CORP.

96 WARREN ST. NEW YORK, N. Y.

CYLINDRICAL SUB-PRESSES

May be adjusted for wear and so perfect alignment can be maintained. This means that the quality of the punchings will not vary and that the life of the dies is increased. Nine diameters of plungers in arch and overhang types in stock. Ask for booklet on Sub-Presses and Dies.

ARCH TYPE

WALTHAM MACHINE WORKS

WALTHAM, MASS.

AVOID CUTTING TOOL TROUBLES

WITH

OLIVER GRINDERS

Many production failures are traceable to incorrect reconditioning of cutting tools. Only properly ground tools will keep your high production machines "on their toes". Oliver Grinders will eliminate tool failures in your plant as users the country over will testify.

OLIVER DRILL POINTERS

The cut illustrates the NEW OLIVER MODEL 510 Drillpointer for drills ¼ to 3" in diameter. Arranged to grind the OLIVER FORM on the drillpoint, with VARIABLE POINT Angles and VARIABLE CLEARANCES. Guarantees the BEST point for your job.

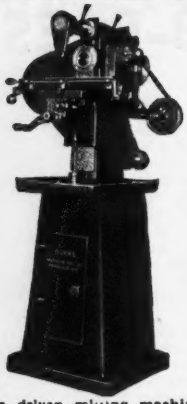
THE OLIVER LINE

Face Mill Grinders, Twist Drill Grinders, Die Making Machines, Cutter Grinders, Precision Tool Grinders.

OLIVER INSTRUMENT CO.

1430 E. MAUMEE ST. ADRIAN, MICHIGAN

BURKE Milling Machines



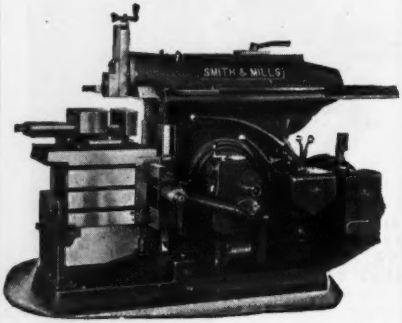
Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

BURKE MACHINE TOOL CO.

297 E. 16th St. Conneaut, Ohio

SMITH & MILLS SHAPERS



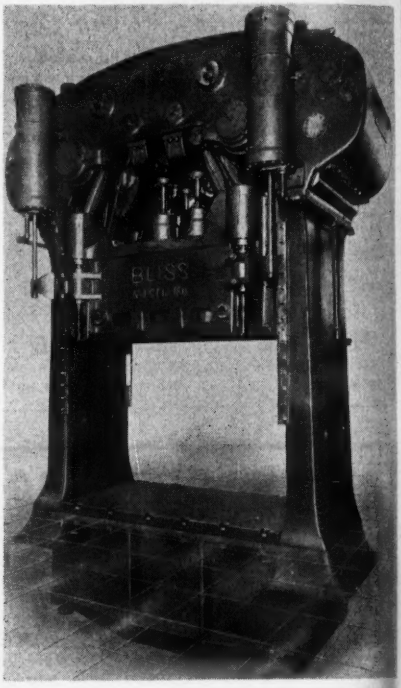
Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

THE SMITH & MILLS CO.

CINCINNATI OHIO

Bliss No. 4-CT-12-180 Four Point Toggle Press

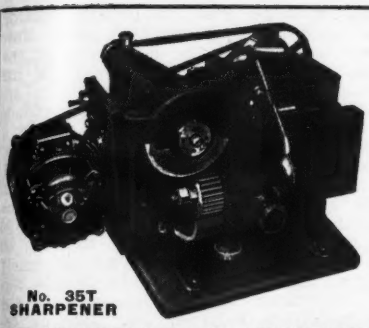
The illustration shows the latest design of Four Point Toggle Press built by the E. W. Bliss Co., Toledo, Ohio. An idea of the massive size of the press may be gained from the fact that the distance between the uprights is 180 in.



Bliss No. 4-CT-12-180 Four Point Toggle Pres

and that the area of the 8-in. thick bolster plate is 100 in. front to back by 180 in. right to left. The press has two crankshafts running front to back which have a diameter of 12 in. at the bearings and 16 in. at the crankpins.

While the No. 4-CT-12-180 Press was designed primarily for drawing large auto body panels, one-piece steel tops for automobiles, and similar stampings, it can be easily and quickly converted to single action operation for blanking work. Located in the bed are six Hydro-Pneumatic cushions of 200-ton capacity which, when used in conjunction with the press operating for double action, are said to give triple action results.



No. 35T SHARPENER

AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

Up to 5½" diameter and up to 1¾" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

WRITE FOR CIRCULAR

THE WARDWELL MFG. CO.

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Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER will do the job so much quicker and better?

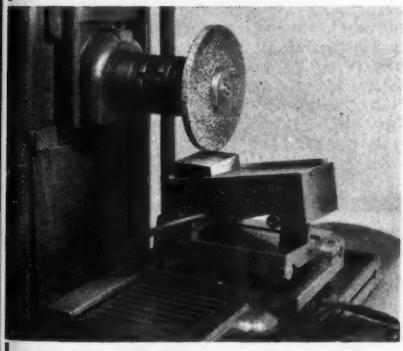
Send for circular

DAVIS KEYSEATER CO.

Exchange & Glasgow Sts.
ROCHESTER, N. Y.

MAGNA-SINE Minimizes Set-up Time

(TRADE-MARK REGISTERED)



Model A-5 MAGNA-SINE adjusted for grinding a compound angle on the face of a block. The combination of angles in this case was 5°10'32" and 10°31'. Set-ups like this take but a few seconds.

First of a series illustrating the MAGNA-SINE in cost reducing set-ups.

The MAGNA-SINE is a magnetic sine table used to hold magnetic material at any angle—either single or compound—for grinding, checking, etc. Standard gauge blocks are placed under the rollers, a switch is turned and the work is held by magnetic force, ready for grinding. Seven sizes cover all production requirements.

Write for complete details.

OMER E. ROBBINS CO.

635 MT. ELLIOTT, DETROIT, MICH.

The cushions are fitted with locking devices that will lock the pressure pads down until the plunger has returned far enough to avoid distortion. The action may be timed to release the cushions at any portion of the up-stroke of the plunger, and the cushions can be released separately in any order desired.

The frame is of tierod construction with the uprights, bed and crown cast from high test alloy pearlitic iron. The gearing is of steel and the reduction is such as to drive the press at either 3½ or 5 strokes per minute by means of a two-speed 25 h.p. motor. The clutch is of the multiple disk, pneumatic friction type controlled by electric palm buttons. In spite of the large size of the press, it may easily be inched for die setting. A central control panel is arranged to give several optional methods of operation by the turn of a switch.

The plunger dimensions are as follows: stroke, 44 in.; shutheight, plunger to bed, 98 in.; adjustment, 25 in; area, front to back by right to left, 79x161 in. The blankholder dimensions are: stroke, 36 in; shutheight, blankholder to bed, 88 in.; adjustment, 25 in. The extremely long adjustments, which are of the rigidly supported barrel type, permit the use of either high or low dies as required.

A Farval system with automatic control provides lubrication for the press.

SMALL GEARS

—In the finer Pitches—14 to 96 D. P.

SPURS
SPIRALS
HELICALS
BEVELS
WORM-GEARING
RACKS
RATCHETS

High precision or commercial production. A few pieces or a million.

You can **SAFELY** entrust your Gear purchases to this exceptionally well equipped and organized plant.

Made to order **Only**—No stock—No Catalog.

Gear Specialties
INCORPORATED
CHICAGO

2620 W. MEDILL AVE., Phone Humboldt 3482

Williams Bantam "Supersockets"

J. H. Williams & Co., 75 Spring St., New York, N. Y., announce the addition of three lines of Bantam Sockets to their

William Bantam "Supersockets"

"Supersocket" wrench line. The lines include Extra Deep 12-Point Sockets 2 to 2½ in. long, in six sizes, with openings from 7/16 to ¾ in.; Extra Deep 8-Point Sockets 1½ in. long, in four sizes, with openings from 7/16 to ⅝ in., and Universal 12-Point Sockets, in four sizes, with openings from 7/16 to ⅝ inch.

All of the above Bantam Sockets are

"OUTWEARS the best Bronze Metal"

20 years ARGUTO without a drink—

ARGUTO OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

ASK FOR THE GENUINE

COMET Vernier Calipers

$5.50

with genuine leather pocket case.

WHY PAY MORE?

Send for one Today!

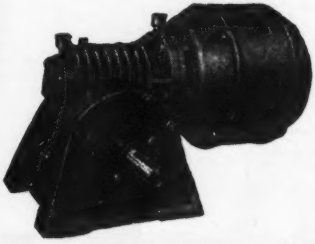
Shop agents, dealers wanted.

Measures to .001" Outside, Inside and Depth

Measuring range 5-5/16". Total length 8". Scales: 1/16" with vernier 1/128". .025" with vernier 1/1000". Decimal equivalents on reverse side of gage. Glass-hard jaws. Fine workmanship. A precision tool at a reasonable price.

COMET TOOLS, Inc.
39 Union Square, New York, N. Y.

Janette
Motorized
SPEED REDUCERS
Sizes From 1/50 to 7½ H.P.



We offer 10 different styles from which to choose the exact reducer to meet your individual requirements.
Bulletins and recommendations on request.
ALSO ROTARY CONVERTERS—
BLOWER WHEELS—MOTOR GENERATORS

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

See The Point

Pat. Appl'd for Fig. 1645

. . . that KNURLING POSITIVELY PREVENTS VIBRATION FROM LOOSENING THE

UNBRAKO

SELF-LOCKING HOLLOW SET SCREW

By merely tightening-up this new Cup Point Set Screw in the ordinary manner, it automatically locks itself in place and WILL NEVER VIBRATE LOOSE BY ITSELF. One important and outstanding advantage in the "Unbrako" Self-Locker is that it can be adjusted over and over again and will lock equally well every time. Another is the absolute lack of resistance offered by the knurling during tightening-up. These facts have been conclusively proven by countless tests made in many different industrial plants and under varied operating conditions.

Write for samples, prices and more information about the use of "Unbrako" knurled-on-the-point Self-Locking Hollow Set Screws.

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA.

Boston, Chicago, Detroit, St. Louis, Indianapolis, Box 556, San Francisco

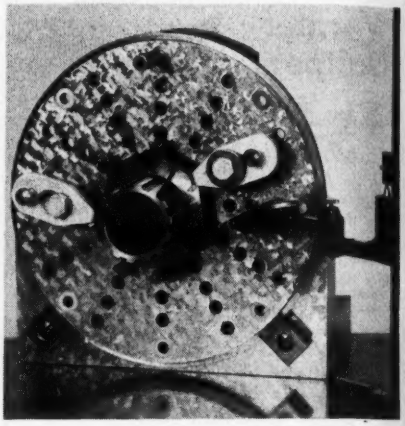
designed for use with ratchets and other handles fitted with ⅜-in. square drive, and have thin walls for operation in close and awkward places. The Universal sockets are very short and compact in design. They operate through a range of 180 deg. and are fitted with spring tension to maintain the desired angle when applying the socket to the job.

Williams "Supersockets" are made from a superior grade of high tensile steel (chrome-alloy) and are heat treated in electric furnaces for maximum toughness and strength.

The Index Master

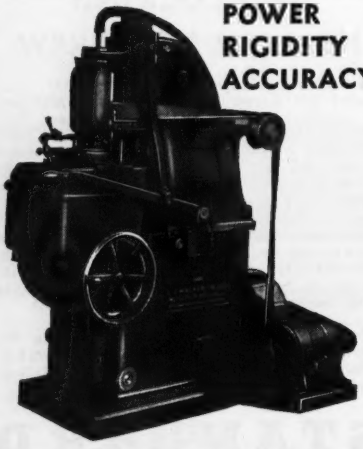
An index fixture for use in layout and inspection work and designed to combine both accuracy and speed has been brought out by The Pump Engineering Service Corporation, 12910 Taft Ave., Cleveland, Ohio. Intended for portability, the Index Master weighs 30 lbs.—heavy enough for stability but light enough to be easily carried.

The fixture consists primarily of an angle iron and an index plate. To the center of the angle iron is fitted a hardened, ground and lapped bushing and on each side the angle iron is cut away, forming steps where hardened, ground and lapped guide plates are anchored. These plates are parallel to both the



The Index Master

center bushing and the base of the angle iron. At the top of the angle iron, and on its vertical center line, another hard-



POWER
RIGIDITY
ACCURACY

WALKER ROTARY SURFACE GRINDERS

For profitable surface grinding on a wide range of work—write for catalog DB-2.

O. S. WALKER CO., INC.
WORCESTER, • MASS.

Improved Anderson
Balancing Ways
No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four-Chilled iron-discs rotate on sensitive Special bearings.

Write for Full Information

Made by Anderson Bros. Mfg. Co.
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NEAT STAMPING in NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

Write for Particulars

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GRANT RIVETERS

● Pioneers in the riveting field. Head rivets from smallest to ⅝" diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs. —Types include Vertical and Horizontal Multiple Spindles.

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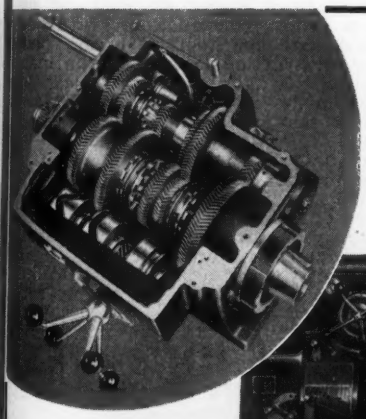
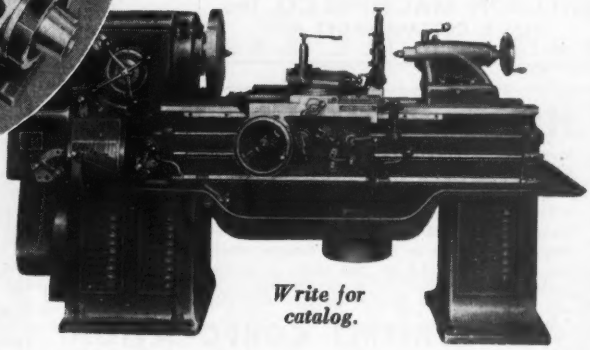
THE GRANT MFG. & MACHINE CO.
96 Silliman Ave. Bridgeport, Conn.



All-Herringbone Transmission
Only in Sidney Lathes

An all-herringbone transmission, composed of 12 continuous-tooth gears, completely eliminates all gear tooth or tool marks from the work. Controlled by Monotrol (1 dial) or Tritol (3 levers). Sizes 14" to 24".



THE SIDNEY
MACHINE TOOL CO.
210 Highland Ave.
Sidney, Ohio

Write for catalog.

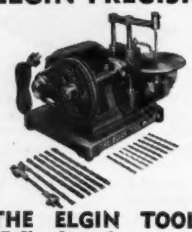
ened, ground and lapped bushing is located 3.500 in. from the center bushing. This is the index bushing.

The vertical index plate revolves on the bearing stud fitted in the center bushing of the angle iron, or it can be clamped in any position. The outside rim of the index plate is graduated by degrees over the entire circumference. Eight index holes with hardened, ground and lapped bushings, are located 45 deg. apart and at the exact center distance not only from the center bushing but also from each other. To double-check on angles, large figures on the edge of the index plate are easily read at a glance.

An index pin inserted in any one of the index bushings, when resting on the guide plate of the angle iron, bring the index plate into exact 45 deg. angle position. When it is necessary to plot any angle other than 45 deg. or its multiple, measuring blocks, mathematically calculated, are placed on either guide plate. The exact angle is located when the index pin comes into contact with the measuring blocks. Tightening the clamps holds the index plate securely in position. The use of the sine bar is entirely eliminated.

Numerous holes for clamping work are drilled and tapped in the face of the index plate. The proper position of the holes, slots and angles in relation to each other can be checked as easily and quickly as they can be plotted. Jigs, fixtures, gages, and similar parts can be checked in a few minutes, using a height gage and indicator.

ELGIN PRECISION DIE FILER



For small accurate Dies, Templates and Model Work. Holds files and laps from the smallest to $\frac{5}{16}$" dia. all shapes.

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THE ELGIN TOOL WORKS, INC.
57 No. State St. Elgin, Ill.

Sheldon Back Geared
Screw Cutting
Precision Lathes

A complete line of precision lathes of up to 12" swing that meet the long felt need for strictly quality lathes at moderate prices. Choice of 12 drives. All standard attachments. See the Sheldon before you buy. Write for catalog.

SHELDON MACHINE CO. Inc.
3259 S. COTTAGE GROVE AVE.
CHICAGO, ILL., U. S. A.

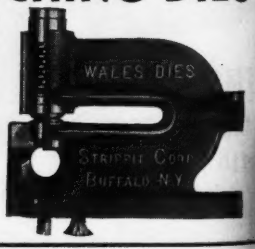
Ridgid No. 65R and 85R Series Pipe Threaders

The Ridge Tool Company, Elyria, Ohio, has introduced the Ridgid No. 65R and 85R series of pipe threaders which are now made of rugged all steel and malleable alloy construction, with drop forged hardened tool steel cam plates. This construction is said by the manufacturer to afford quicker, easier pipe threading. The No. 65R and 85R series thread four sizes of pipe—1, 1¼, 1½ and 2 in.—with one set of chaser dies. Only four dies instead of the usual 16 stay in the threader, saving time and trouble for the operator. The dies are made of semi high speed tool steel.

The pipe threaders offer a choice of two practically automatic work holders —a cam type and a plate type. No bushings are used; both types simply set to

HOLE-PUNCHING and NOTCHING DIES

Manufacturers of refrigerators, airplane, vehicle bodies, heating and air conditioning apparatus, metal furniture and similar products will find wide use for **WALES** individual dies. These self-contained, sub-press type dies operate in press or press brake. Quick set-up—never obsolete—re-locate for new parts. Standard holes up to ⅞" dia.—square notches up to 5x5—Also Vee Notches—in 14 ga. flat sheet or under.



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1559 NIAGARA ST. BUFFALO, N. Y.

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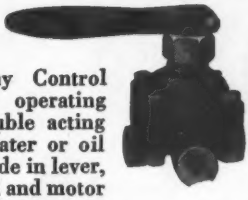
Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

ACME INDUSTRIAL COMPANY
212 N. Laflin St.
Chicago, Ill.

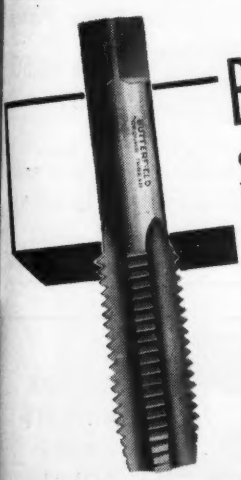
3 and 4-Way Control Valves



3 and 4-Way Control Valves for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressures up to 3000 lbs. Bulletins on request.

Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam Traps and Separators, Air Separators, Traps and Vents, Etc.

W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Penna.



BUTTERFIELD TAPS

● You don't buy TAPS—you buy the profit that taps give you. Compare BUTTERFIELD TAPS with other taps for long life and cost per accurate hole. The difference will reavel the superiority of BUTTERFIELD TAPS and their profit possibilities.

Compare -- Buy -- Profit

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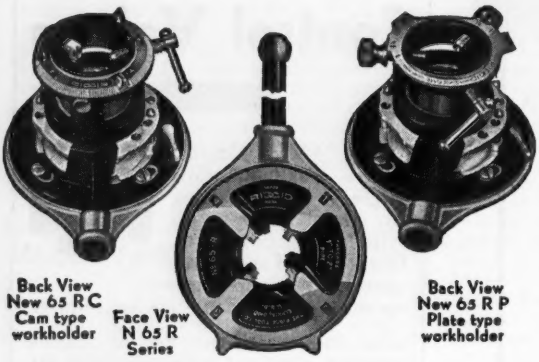
BUTTERFIELD DIVISION
UNION TWIST DRILL CO. DERBY LINE, VERMONT, U. S. A.
Factories—Derby Line, Vermont; Athol, Mass.; Rock Island, Quebec, Canada; Mansfield, Mass.

pipe size and are tightened with one screw. The work holders take 2-in. close nipples. Closed chaser slots on the holders. The chaser dies fit any make of poster threader and all dies of the same number are identical and are interchangeable with any similar number of any other Ridgid poster set.



Back View New 65 R C Cam type workholder

Face View N 65 R Series

Back View New 65 R P Plate type workholder

die face will not stretch.

The manufacturer has also announced a Ridgid series of poster pipe threaders with all steel and malleable alloy construction. Four sets of chasers thread 1 to 2-in. pipe. Full-floating posts are separately replaceable. The threads also give a choice of cam or plate type work

G.E. 100-Watt Fluorescent Lamp

Out of the laboratory which produced the 100-watt high efficiency bulb-type mercury lamp comes a new light source for general industrial lighting, a 100-watt fluorescent lamp. Developed by the General Electric Vapor Lamp Company, 897 Adams St., Hoboken, N. J., to supplement its line of industrial lighting units such as the long-tube Cooper Hewitt lamp, the new lamp is a tubular light source, 4-ft. in effective length.

The lamp derives its terminology "fluorescent" from its utilization of a special high efficiency fluorescent material as the inside coating of the tube. Ultra violet radiations produced in the tube are converted by this coating to visible

● AUTOMATICALLY LEVELS WORK
● NO HAMMERING - NO DISTORTION
SAVES TIME
●
CUTS COSTS
DOWN-GRIP MACHINE TOOL VISE
New Bulletin ready, Write
The Kravan Co., Waterbury, Conn.

New Nesting Type Tote Pans

Lots of 50 $1.00 each
20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.
Lots of 100 & 200 less 3%; 300 up less 5%
J. L. LUCAS & SON, INC.
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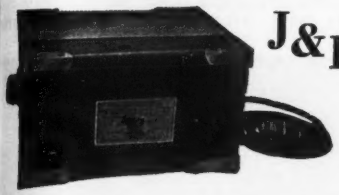
HINGES
VARIOUS WIDTHS and GAUGES

BUTTS AND CONTINUOUS LENGTHS
WRITE FOR PRICES
For GUARDS CABINETS CASES BOXES
S & S MACHINE WORKS
4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS



J&H

The Demagnetizer

For Alternating Current

The J & H Demagnetizer requires no countershaft, belts, or other intricate electrical connections. All that is necessary is to plug it into the nearest lamp socket or receptacle.

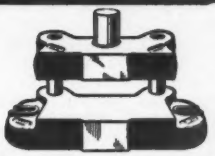
It is of the new Unipole type — heavy duty — and can be supplied for either 110 or 220 volt alternating current. Size 12" long, 9" deep, 6" high. Weight 60 lbs.

Sold On One Week's Trial

J. & H. ELECTRIC CO.

202 Richmond Street, Providence, R. I.

BAUMBACH



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Machined Steel — DIE SETS — Semi-Steel

DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, a listing of more than 185,000 stock sizes and 46 different styles afford a service that is unsurpassed.

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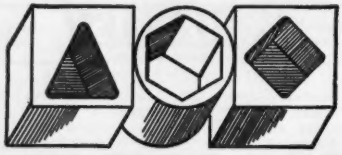
light by means of a high ratio energy transformation. The rated life of the fluorescent lamp will compare favorably with that of other industrial light sources.

Probably the most outstanding feature of these lamps, resulting from use of the phenomenon of fluorescence, is their high efficiency. Contrasting with the 100-watt bulb-type mercury lamp, for example, whose initial efficiency is 35 lumens per watt (more than twice that of incandescent lamps of the same wattage), the efficiency of the 100-watt fluorescent lamp is 50 lumens per watt, or three times that of equivalent wattage incandescent light sources.

The new lamp is a result of three years of exhaustive laboratory research by the General Electric Vapor Lamp Company, which has advocated tube light sources for over 35 years, paving the way to the development of the fluorescent tube light source in this country. The 100-watt fluorescent lamp is expected to find application in industry as an extension of this company's line of high output tubular light sources.

G. E. 100-Watt Fluorescent Lamp for Industry



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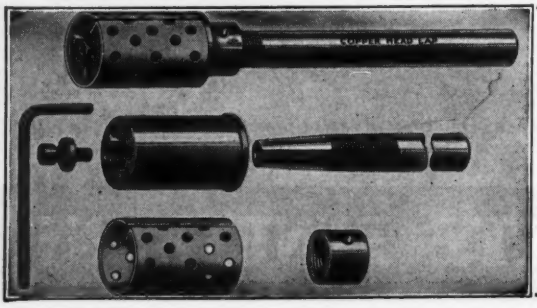

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Yale "Cable King" Air-Cooled Electric Hoist

The line of hoisting equipment made by The Yale & Towne Mfg. Co., Philadelphia, Pa., has been augmented by the addition of the "Cable King" Hoist illustrated herewith. The design of the hoist

Yale "Cable King" Air-Cooled Electric Hoist

incorporates the usual Yale Features of ruggedness, strength, simplicity of design, standard interchangeability of parts, and high overall efficiency.

The feature of the hoist is the "air-cooled" design. Fins simulating a Sirocco blower are cast in the brake drum in the line of the air stream. As the load is lowered, the fins revolve, producing an air circulation and cooling action that forces the air around the brake and gear housing. Vents in the bottom of the housing provide for free circulation of air. Laboratory tests in which capacity loads were lifted and lowered thousands of times, the equivalent of many years of service, prove that air cooling increases the ability of the hoist to per-

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Thanks to its multiple spline design in the socket head, into which the Bristo wrench locks tight, a Bristo Screw will not round out, split, strip or shear. You save assembly time. Even the smallest sizes take a tighter set than is possible with ordinary screws, without the wrench skidding. No waste motion.

Electric shavers and many other products assembled faster with Bristo Screws.

Bristo Screws help lower production costs in the manufacture of such products as electric shavers, sewing machines, X-ray machines, tabulating and computing machines, stock market tickers, cameras, postage meters, scientific instruments, and vending machines. Write for Bulletin 83-5 P

Approved by Amer. Standards Assoc. *and* Amer. Soc. of Tool Engineers.

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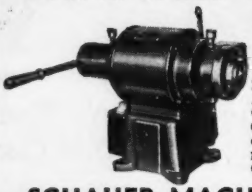

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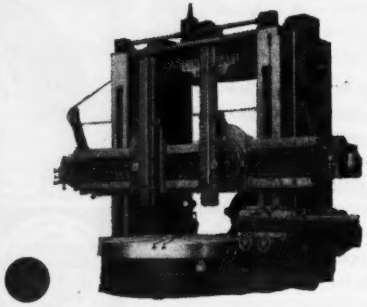

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CRANK PLANERS
PLANER TYPE MILLERS
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THE CINCINNATI PLANER CO.
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form on a heavy duty cycle.

The main hoist frame is a heavy one-piece ribbed steel casting. The entire train of gears and the brake load assembly are totally enclosed in an oil-tight housing and operate in an oil bath. All gears are 20 deg. full depth tooth straight spurs with a modified involute tooth form for strength. Drive shafts, gears and pinions are chrome nickel steel forgings, heat treated, hardened and ground. Shafts operate in double sealed ball bearings of an extra wide type. The cable drum is mounted on precision roller bearings. All drive shaft and gear train bearings are lubricated from the oil reservoir.

The hoist can be supplied with D.C. compound wound totally enclosed ball bearing motor or A.C. squirrel cage high torque totally enclosed ball bearing motor. Both the motors have been especially designed for hoist service in accordance with N.E.M.A. specifications. The rotor shaft is mounted on two permanently sealed extra wide type ball bearings with life-time lubrication. Motors are capable of delivering their rated horsepower for a period of 30 minutes with a maximum temperature rise of 55 deg. C. Standard control equipment is of two types; manual (pendant cord) and push button. Standard controls are single speed. Controls are arranged for one-hand operation. It is adaptable to remote operation, making possible control of several hoists from one station or control of one hoist from several stations. The load brake is Weston screw and disc type. The motor brake is external contracting drum type with large diameter drum fitted direct to the main splined drive shaft. All hoists are equipped with upper safety limit stop, operated mechanically. The hoist is supplied in capacities of ¼, ½, 1, 1½, 2, 3, 4, 5 and 6 tons, to use motors of from ¾ to 10 h.p.

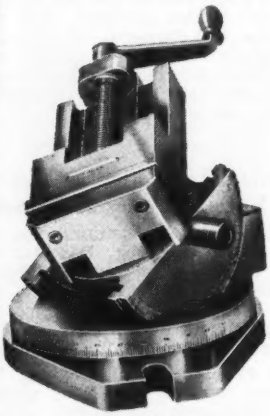
CENTERLESS GRINDING

Accuracy—Prompt Service

Commercial Centerless Grinding Co.
6538 Carnegie Ave., Cleveland

Wesson Universal Vise

The Wesson Universal Vise shown in the illustration, product of Wesson



Wesson Universal Vise

Company, 1050 Mt. Elliott Ave., Detroit, Mich., is made of steel and for this reason is said to be both extremely light and sturdy. The jaws are of hardened tool steel, ensuring maximum wear.

Completely graduated in all planes, the work can be swung to a full 90 deg. in top and side planes and a full 360 deg. in the bottom plane. Inasmuch as cradle base guides extend ¾ in. above the center line, a heavy milling cut can be taken when using this vise.

The vise is supplied in two sizes: Nos. 1 and 2. The height of the No. 1 is 6¼ in.; maximum opening, 4 in.; jaw width, 4 in.; base width, 7¾ in.; base length, 10¾ in.; and weight, 46 lbs. The height of the No. 2 vise is 4⅜ in.; maximum opening, 1-5/16 in.; jaw width, 3 in.; base width, 3½ in.; base length, 6 in., and weight, 9 pounds.

Dearborn Automatic Chucking and Indexing Fixture

To expedite production operations on milling machines, drill presses, or shapers, the automatic chucking and indexing fixture illustrated herewith has been brought out by J. W. Dearborn, Ansonia, Conn. The feature of the fixture is the draw-in collet in which round work up to 1-in. diameter can be held and hexagon, square or other shape work can be

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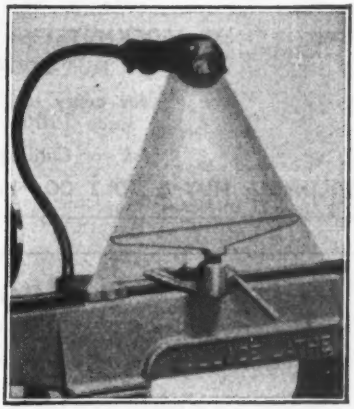
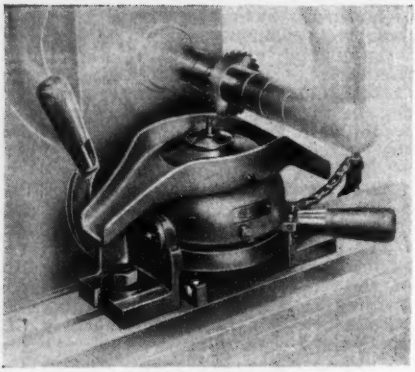


VIMCOLIGHTING is standard equipment on Wallace lathes and portable machines.



Dearborn Automatic Chucking and Indexing Fixture

held by the use of special collets.

The collet is opened and closed automatically by the forward and backward motion of the milling table. Work is automatically ejected from the collet upon completion of the operation. Work can be indexed without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24-sided pieces, or the same number of slots.

Outside flats can be milled on a taper with a straight standard milling cutter by tilting the fixture to the required angle. A positive stop is instantly set for each indexing position and a positive stop to gage the height of the piece in the collet is also provided. This stop can instantly be changed. A minimum of time is required to set up a job, as all adjustments are easily and quickly made. Collets can be changed instantly without the use of tools.

Standard "Cadet" 12-In. Ball Bearing Pedestal Grinder

The illustration shows the "Cadet" 12-In. Ball Bearing Pedestal Grinder which has been developed by The Standard Electrical Tool Company, 8th and Evans Sts., Cincinnati, Ohio, to meet the demand for a low-priced tool without sacrificing substantial construction.

The grinder is ball bearing equipped and has capacity for 12-in. diameter by 2-in. face grinding wheels. The emery wheel guards are of the safety type, being enclosed and adjustable to the wear of the wheels. Each guard has an exhaust outlet, adjustable spark breaker, and tool rest.

The grinder is available for alternating

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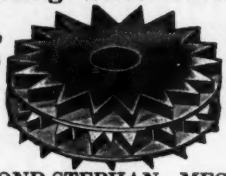

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The Canadian Desmond-Stephen Mfg. Co., Ltd.
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No. 1 Capacity 0 thru 3/32" wire, $1.25
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The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

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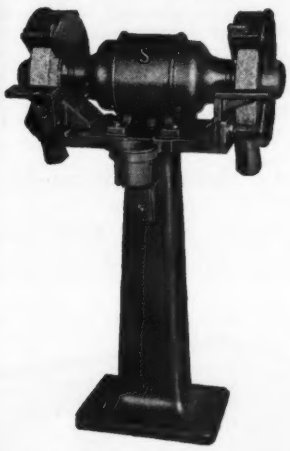
current only, two or three phase, 220, 440 or 550 volts, 50 or 60 cycles. Power is supplied by a 1750 r.p.m. totally enclosed motor. Equipment includes a three-pole toggle switch and water pot.



Standard "Cadet" 12-In. Ball Bearing Pedestal Grinder

The distance between wheels is 20 in.; height, floor to center of spindle, 40 in.; net weight, 328 pounds.

Miccro Supreme Better Seal Compound

The Michigan Chrome Company, 6340 E. Jefferson Ave., Detroit, Mich., has developed and placed on the market a liquid compound to be used as a permanent seal for joints and seams on equipment where gases, oil, steam, and so on, are used. The compound is to be known as Miccro Supreme Better Seal Compound.

Among its many applications are pipe threads, face joints, tank seams, compressors, gaskets and valves, the coating of metal—in fact, wherever leakage is likely to occur, this compound is said to offer protection against even the smallest opening which might be caused by vibration, expansion, contraction or chemical damage resulting from the contact of certain gases or solvents on metal surfaces.

Miccro Supreme Better Seal Compound is completely insoluble in gasoline, oil, steam, gases such as Freon, methyl chloride, ammonia and sulphur dioxide, and

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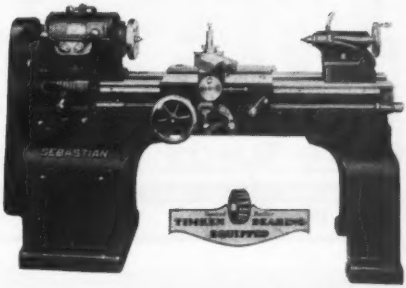

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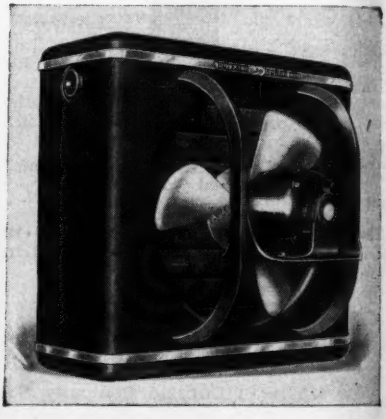
in the majority of commercial solvents (alcohol excepted). While the compound possesses unusual adhesive qualities, it is said to be extremely elastic and will withstand the most severe vibration without cracking. Once applied it becomes a permanent seal, eliminating the possibility of future leakage. It can be applied instantly with either a brush or the fingertips. It sets quickly, permitting the equipment to be put back into operation without delay.

Buffalo Model C Breezo-Fin Unit Heater

To the line of unit heaters manufactured by Buffalo Forge Company, 388 Broadway, Buffalo, N. Y., has been added



Buffalo Model C Breezo-Fin Unit Heater

the Model C Breezo-Fin Unit Heater illustrated herewith. Incorporating the features which are characteristic of Buffalo unit heaters, the design of the Model C is also intended to meet the demand for attractive appearance. Of streamlined design, the heater is finished in a dull lustre brown metallic color which resembles old hammered copper. It is built to blend inconspicuously with a variety of backgrounds. There are no unnecessary protuberances to make installation difficult.

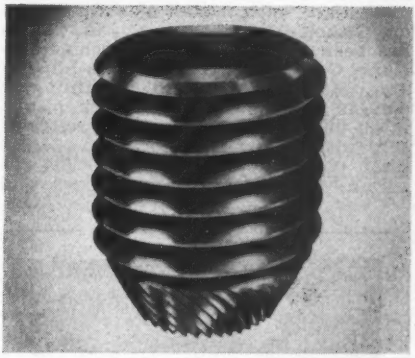
The heater element used in the Model C Breezo-Fin is a one-piece seamless copper tube with square copper fins spaced to provide maximum radiation. The casing is of entirely new design with every joint and corner smoothed and

rounded. A new type of motor mounting permits the use of motors of various makes without difficulty and holds the motor and fan in perfect alignment with the heater. Rubber silencers dampen all motor vibrations. The fan, of the high efficiency wheel type developed by Buffalo engineers, has been slightly modified to provide maximum capacity with a minimum of air noise. Louvres have the exact curvature required to deflect the heated air with a minimum of friction. Easily adjusted, they stay set in any desired position. Motors can be supplied in either constant speed single phase, three phase or direct current—particularly suitable for this service. Two-speed motors, operating at approximately full load and 65 per cent of full load speed, for single phase and direct current, are available in all listed sizes. The heater is available in five sizes ranging from 12 to 24 in. Each size may be had with either one or two row coils, for low or high temperatures.

"Standard" Cup Point Set Screw

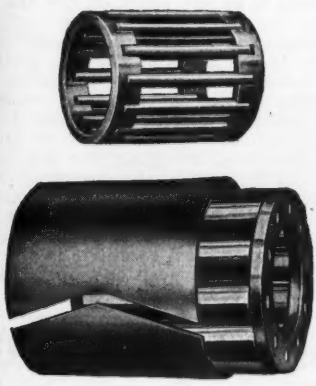
Shown herewith is the new Cup Point Set Screw which has been placed on the market by Standard Pressed Steel Company, Box 556, Jenkintown, Pa., and which was announced on page 198 of the October, 1938 issue of MODERN MACHINE SHOP.

As can be seen from the illustration,



"Standard" Cup Point Set Screw

when the screw is turned into place the knurled edges effectively grip the shaft in such manner that loosening or backing off is impossible except by the use of a wrench. Cup Point Set Screws are available in a wide range of sizes.



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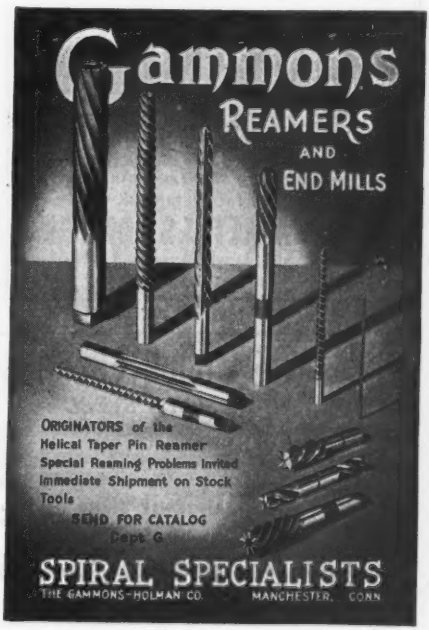

Gisholt Seven-Position Fixture

A seven-position indexing fixture which is said to provide an efficient and accurate means of machining tees, ells, crosses and valve bodies of various sizes on Gisholt Heavy Duty Turret Lathes has been developed by the Gisholt Machine Company, 1217 East Washington Ave., Madison, Wis. All machining is done in a single chucking, which results in all dimensions being in true relationship with reference to each other. The seven positions provided for in this fixture are 0, 45, 90, 180 and 270 deg. and two positions of approximately 3 deg. off center, and these are held to an accuracy within a second for machining gate valves. Fixtures of this type may be arranged for holding different size flange pipe fittings or flange valve bodies.

Gisholt Seven-Position Fixture

The work is chucked simply by turning a wrench at the bottom of the fixture which opens and closes the jaws. The castings are automatically located on center in hardened steel locating pins which hold them firmly and securely. Different jaws are supplied for the different size and shape fittings.

Indexing is simply and rapidly done. The 0, 45, 90, 180 and 270 deg. positions are indexed by merely loosening the clamping plates, raising the hardened steel indexing pin from its seat in the cradle and turning the cradle to the desired position, dropping the pin in its seat and tightening the clamping plates. To index the cradle to the 3 deg. positions on either side of center for machining gate valve seats, an indexing pin with hardened steel eccentric is provided. This pin has two positions, one of which

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17 Other Styles—See Catalogue
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UP TO 500 BRINELL USE
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indexes the cradle to the right of center and the other to the left of center the desired amount. The entire fixture, sliding on the face plate, is moved by means of a screw to one side to bring the center of the valve seat apertures in line with the center of the turret.

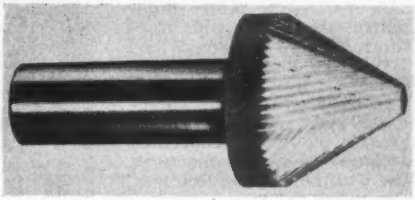
The fixture is heavily constructed of cast steel and is bolted directly to the flanged spindle nose. All pressure of the jaws holding the valves and pipe fittings is taken by the cast steel cradle itself, thereby eliminating any binding of the indexing bearings. The cradle is mounted in ball bearings, which permits it to be indexed with a minimum amount of effort on the part of the operator. The clamping plates which bind the cradle in position are of hardened and ground steel and remove all strain from the indexing pins. Fixtures of this type are available on special order. They may be used on Gisholt 3AL, 4L or 5L Heavy Duty Turret Lathes.

Severance Inside Burring Cutter

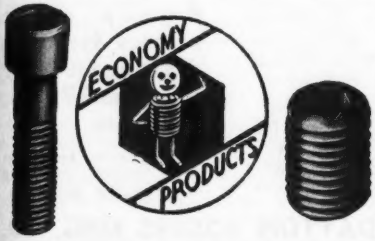
To the line of "Midget" Milling Cutters made by Severance Tool Mfg. Company, 1516 E. Genesee Ave., Saginaw, Mich., has been added the inside burring cutter illustrated herewith. This tool is ground from the solid after hardening. Of segmental pattern, the teeth are designed to completely eliminate chatter and preclude the development of secondary burrs.

Besides its obvious use for burring pipe and tubing, the tool is said to excel on such applications as removing fins from cored holes in iron castings as well as flashes from die castings. The tool is used in reamer heads, speed lathes, drill presses, or mounted direct to fractional horsepower motors.

The tool is made in four sizes, in diameters of ½, 1, 1¾ and 2½ in. and in lengths of 7/16, ¾ and ⅞ inch.



Severance Inside Burring Cutter



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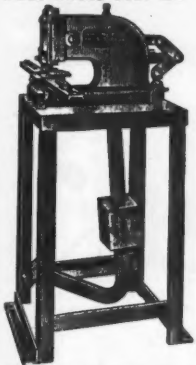
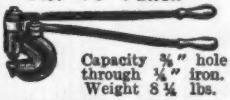
Foot Press No. 28



Capacity 2" hole in 16 gauge — 100 holes per minute.

No. 10 Punch



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Capacity 2x2 ½" Angle Iron Weight 44 lbs.

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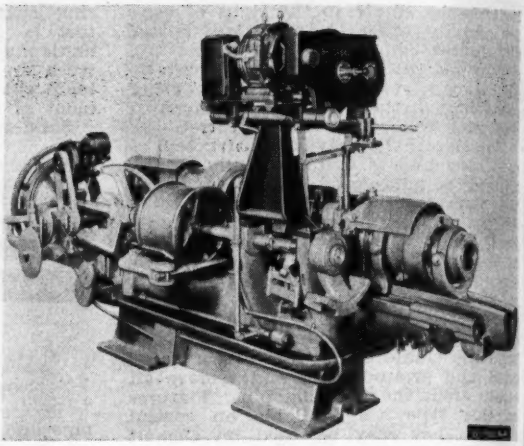
Cullman Redesigned Motor Drive

The illustration shows a Cullman Motor Drive installed on a 5½-In. Cleveland Automatic Screw Machine. The Cullman Drive has recently been redesigned by the manufacturer, the Cullman Wheel Company, 1336 Altgeld St., Chicago, Ill., and is now furnished with a three-speed gear case. The main bracket has been especially designed to fit the machine. The Cullman Speed Reducer, also used on this machine, is equipped with a heavy flywheel which will help in the application of extra pressure to the collet when locking and will prevent the work from slipping in the base.



Cleveland Automatic Screw Machine Equipped with Cullman Redesigned Motor Drive

Feed-As-You-Need Chuck

The illustration shows the Feed-As-You-Need Chuck, product of Scully-Jones & Company, 1901 S. Rockwell St., Chicago, Ill., which has been so named because the construction of the tool allows it to hold a drill within its body and feed it out by means of a screw

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arrangement. Thus only the amount of the drill necessary to go through the work and drill bushing need project from the chuck. Breakage of drills is said to be eliminated by this method of holding and driving drills, because of the shorter grip.

In multiple-spindle machines all drills

Feed-As-You-Need Chuck

can be adjusted to project the same distance from the spindle. The Feed-As-You-Need Chuck can be adapted to drilling, counterboring and spotfacing to a given depth with the use of proper combinations.

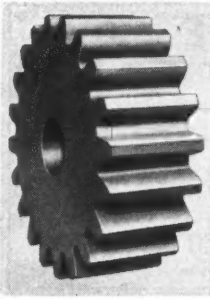
BOOKS

Applied Time and Motion Study. Published by The Ronald Press Company, 15 East 26th St., New York, N. Y. Board covers. 347 pages, 39 figures, including tables and charts. Price, $3.75.

Time and motion study, perhaps because of their different origins, were looked upon in the early days of industrial management as distinct mechanisms. In this book, however, these two management devices are combined as a unified whole—as they have been in the author's practice—for the one is an essential preliminary to the other.

In this book the author presents easy-to-apply ideas and new technics that have revolutionized time and motion study and they have made it a thoroughly practical means for cost reduction under today's conditions. It contains much material that is published here for the first time and shows the improvements that have been made in time and motion study methods which make possible their application to a much wider range of businesses and problems than was formerly thought practicable.

Here, for the first time in print, are shown the exact times for performing all elementary motions, to four decimal places. These times, based on more than one thousand observations each, have stood the acid test of over three years of shop application in day-by-day shop work. The treatment of "therbligs" and body member movements is



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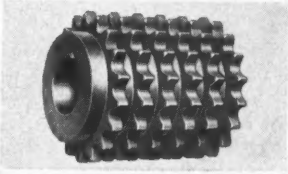

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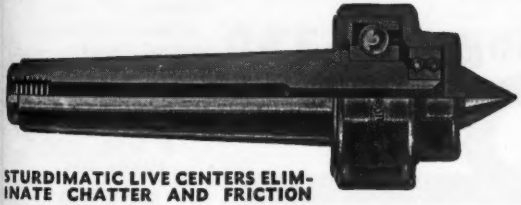

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said to be the most advanced and complete that has been published. Process and motion charts, fatigue, leveling, and operation analyses are given the importance and practical interpretation they have long needed. The author covers in full detail every point necessary to know about making and applying time and motion study methods in any plant—regardless of whether the plant is a production plant or whether it manufactures to customers' specifications.

Beginning with a discussion of the Economy Problem in Industrial Organization, the author carries the reader through discussions of Qualifications of the Operator, Work Habits, Skill and Rhythm, Qualifications of the Analyst, Time Study Methods, the Twenty-Four Therbligs, Body Member Movements and Times, Motion Analysis, and other items totalling in all 18 chapters.

Mr. Holmes' knowledge of his subject comes from long experience and study. His experience includes efficiency analysis, tool and die making, production work, and time and motion study for the Buick, Chevrolet and Detroit Timken Axle organizations. He is well known for his articles on these and related subjects written for the technical magazines.

Molybdenum in Steel is discussed in all of its various ramifications in a 159-page loose leaf book now being distributed by Climax Molybdenum Company, 500 Fifth Ave., New York, N. Y. The book is divided into 13 sections under these headings: (1) Introduction; (2) Chromium-Molybdenum SAE 4100 Series; (3) Ni-Cr-Molybdenum SAE 4300 Series; (4) Nickel-Molybdenum SAE 4600-4800 Series; (5) Carbon-Molybdenum; (6) Manganese-Molybdenum; (7) Silicon-Molybdenum; (8) Elevated Temperature; (9) Corrosion Resisting; (10) Nitriding; (11) Die Steels; (12) High Speed Steels; (13) Cast Steels, and General Index.

Starting with a discussion of the three forms in which molybdenum is added to steel, the reader is led through a dissertation upon the physical properties of the alloy and fabrication characteristics. Under the various headings an exposition is presented of the characteristics of the various types of alloys in which molybdenum is used. Instructions are given for machining, welding, and heat treating, together with tables and graphs. Altogether, the book should serve as a dependable reference concerning the uses and advantages of molyb-

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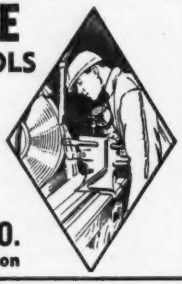

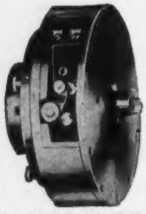

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Steel Buyers' Guide. A handy pocket-size book which gives complete listings and descriptions of the wide range of Certified Steels and allied products carried in stock for immediate shipment by Joseph T. Ryerson & Son, Inc., Chicago, Ill., has been issued by this firm. Included in this stock list are handy reference tables, weight charts, standard specification listings and so on. Among the products described are beams, channels, angles, plates, bars, strip steel, cold finished bars, alloys, tool steels, flat wire, stainless steel, mechanical and boiler tubing, welding rod and wire, bolts, and rivets. Copy free to mechanical executives upon request.

Mauser Tools. George Scherr Company, 130 Lafayette St., New York, N. Y., announces the publication of a four-page folder describing the precision measurements and various applications of Mauser tools. Outside diameters and thickness, inside diameters, distance between bores, depth measurements and height gage work such as scribing and layout are covered. A supplementary folder lists fourteen benefits that both employers and mechanics derive by the use of vernier calipers in the shop and plant. Copies free upon request.

Covel Bulletin No. 9-38, now being issued by Covel Manufacturing Company, Benton Harbor, Mich., describes the latest designs of Yankee Twist Drill Grinders with a new attachment for grinding regular twist drills, two, three or four-lip drills, counterbores, dual and special drills. The bulletin contains 16 pages of illustrations and descriptions. Copy free upon request.

National Acme Model RPL Four and Six Spindle Automatic Chucking Machines, Bulletin 3804. This bulletin, now being distributed by The National Acme Company, 170 East 131st St., Cleveland, Ohio, consists of a 10-page loose leaf catalog, in which the features of design of the Acme Model RPL Chucking Machine are presented. The machine is described in detail and the various operating parts and units are illustrated. Specifications are included. Copy free.

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Tannewitz Metal Cut-Off and Miter Machines are the subject of a four-page folder now being issued by The Tannewitz Works, Grand Rapids, Mich. The various types of wet and dry cut-off machines are illustrated and described. Copy free upon request.

Colwell Tool Post Turrets are discussed in a six-page folder now being issued by S. G. Colwell, 25 Congress Ave., Providence, R. I. The folder includes photographs and descriptions of the various types of tool post turrets made by this firm, together with tables of specifications and prices. Copy free.

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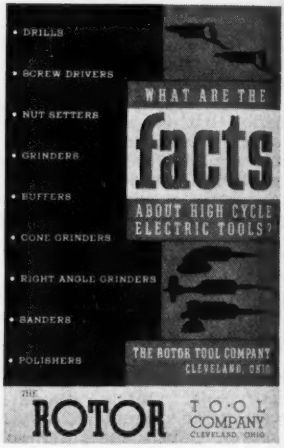
What Are the Facts About High Cycle Electric Tools? The plant owner, executive or equipment buyer who is considering the installation of high cycle electric tools will find a wealth of information concerning such tools in this new 32-page edition which is now being issued by The Rotor Tool Company, Cleveland, Ohio. Beginning with a complete exposition of high cycle current and the high cycle motor, the text gives the reader a clear idea of the conditions under which high cycle tools can be operated to advantage and the low power, operating, and maintenance costs available through the use of these tools. Altogether, the book answers practically every question that can arise in regard to the application of high cycle design to drills, screw drivers, nut setters, grinders, buffers, cone grinders, right angle grinders, sanders, and polishers. Copy free upon request.



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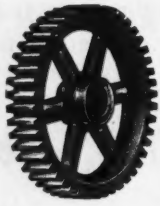
Lake Erie Hydraulic Presses. Bulletin 138 now being distributed by the Lake Erie Engineering Corporation, Buffalo, N. Y., presents several examples of the adaptability and economy of hydraulic presses for limited as well as larger production in the metal working industry. The folder is well illustrated with installation photographs. Copy free upon request.

"How Air is Being Used in Your Industry." This 26-page booklet comprises, in effect, a survey of the practical, time and money-saving uses of compressed air in all types of industries. The jobs listed are practical applications which are regularly being made in plants where costly hand labor and hand equipment is being replaced with modern handling devices. The book also contains a number of condensed reports on the uses of Curtis air hoists and cranes in a variety of industries. Copy free by addressing Curtis Pneumatic Machinery Co., St. Louis, Missouri.

"Asbestos-Protected" U. S. Motors are the subject of a folder published by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Cal., to explain the method used in insulating and winding these motors. Copy free upon request.

Nickel Cast Iron Data, Section 1, Number 1. Entitled "Guide to the Specification of Grey Iron Castings", the object of this data sheet is to aid the engineer or designer in selecting, for specification purposes, a range of composition which will produce a suitable combination of physical characteristics in a casting of a required thickness of section. Copies are available from The International Nickel Company, Inc., 67 Wall St., New York, N. Y.

National Acme Model R Four and Six Spindle Automatic Screw Machines, Bulletin R-3708. This bulletin contains, in loose leaf form, 22 pages of illustrations and descriptions of the Model R Acme-Gridley Multiple Spindle Automatic Screw Machine, product of The National Acme Company, 170 East 131st St., Cleveland, Ohio. All operating parts of the machine are described and illustrated in detail and the bulletin includes specifications for the various sizes of Gridley Model R Automatics. Copy free upon request.



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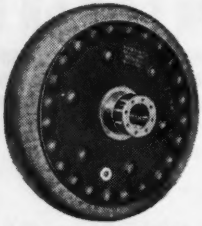

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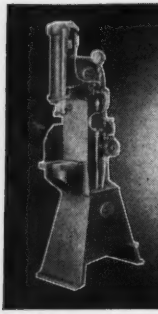

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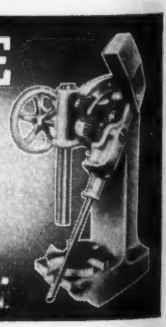

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Precision Gear Tooth Chamfering, Burring and Milling. The three types of Cimatool Chamfering Machines, designated as Models A, B and C, are illustrated and described in an attractive eight-page bulletin now being distributed by The Cimatool Company, Dayton, Ohio. Sixteen advantages of the Cimatool machines are listed, and the combinations of work and cutter heads which provide a wide range of possible operating methods are explained. Copy free upon request.

Simplex Precision Boring Machines recommended by the manufacturer, The Stokerunit Corporation, 4548 W. Mitchell St., Milwaukee, Wis., for economical precision boring of all metals with tungsten carbide or diamond tools, are presented in an eight-page bulletin. The flexibility of these machines is demonstrated by several different work setups showing boring, turning and facing, frequently in one operation. Copy free upon request to mechanical executives or production engineers.

"Air Tight" is the title of a folder now being distributed by A. Schrader's Son, Brooklyn, N. Y., in which the uses of air for industrial purposes is discussed. Beginning with rule of thumb tests for checking an air system, a paragraph is devoted to the listening test and another to the timing test for discovering the air tightness of a plant air system. Two pages are given over to a discussion of making the air lines tight, followed by descriptions of the various types of equipment made by this firm. Copy available without charge to mechanical engineers and plant executives upon request.

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A new catalog, featuring the J & L Automatic Thread Grinding Machine, has been issued by Jones & Lamson Machine Co., Springfield, Vt.
2. **Cutting Oils and Bases**
A new folder outlining a complete series of cutting oils for every machining need has just been issued by E. F. Houghton Co., Philadelphia, Pa.
3. **Comparator**
Folder 118 illustrates and describes the Microlux Comparator for modern inspection methods. George Scherr Co., 130 Lafayette St., New York, N. Y.
4. **Flexible Shafting**
Stow Mfg. Co., Inc., 1 Shear St., Binghamton, N. Y., has announced a new catalog No. 38 covering the line of Stow Flexible Shaft equipment.
5. **Tote Pans and Stackracks**
Illustrated folders and price lists on Stackbin Tote Pans and Stackracks have been issued by Stackbin Corp., 53 Troy St., Providence, R. I.
6. **Handbook on Tapping**
A New Handbook on Tapping, containing much valuable information for tap users, has been issued by The Winter Bros. Co., Wrentham, Mass.
7. **Automatic Dies and Taps**
Catalog D-38, just off the press, describes and illustrates in its 64 pages 17 styles (95 sizes) of Dies and Taps manufactured by National Acme Co., 170 East 131st St., Cleveland, Ohio.
8. **Worm Reducers**
Thomas Prosser & Son, 120 Wall St., New York, N. Y., has ready for distribution a new 32-page catalog, beautifully illustrated and describing in detail Radicon Worm Reducers.
9. **Surface Grinder**
Catalog GL108 is now available from Gallmeyer & Livingston Co., 308 Straight Ave., S. W., Grand Rapids, Mich. It illustrates and describes the Grand Rapids Hydraulic Feed Surface Grinder.
10. **Washer Stock List**
Wrought Washer Mfg. Co., 2201 South Bay St., Milwaukee, Wis., has issued a new Washer Stock List listing over 2,000 sizes.
11. **Boring Tools**
Data has been released by Eclipse Counterbore Co., 7410 St. Aubin, Detroit, Mich., completely detailing the new line of MikrO-LoK boring tools.
12. **Flexible Shaft Equipment**
A new folder illustrating and describing the new Walker-Turner Flexible Shaft Line is available from Walker-Turner Co., Inc., 7118 Berckman St., Plainfield, N. J.
13. **Comparators**
Pedestal and Bench Type Comparators are illustrated and described in a catalog available from Jones & Lamson Machine Co., Springfield, Vt.
14. **Vertical Millers**
W. B. Knight Machinery Co., St. Louis, Mo., has issued folders illustrating and describing the five sizes of Knight Millers.
15. **Shop Tools**
More than 3,000 precision tools and dial indicators are shown and described in Catalog No. 26MD. The L. S. Starrett Co., Athol, Mass.
16. **Quill Bearings**
Full Engineering Data on Bantam Standard Series Quill Bearing is available in Bulletin 103K. Bantam Bearings Corp., South Bend, Ind.
17. **Contour Machines**
Do-All Contour Machines for band sawing, band filing and band polishing are reviewed in a 100-page hand book which may be obtained from Continental Machines, Inc., 1306 S. Washington Ave., Minneapolis, Minn.
18. **Cleaning Materials**
Greater Industrial Safety thru Modern Oakite Cleaning Materials and Methods is the title on a new book-

let which is ready for distribution by Oakite Products, Inc., 36 Thames St., New York, N. Y.

19. **Threading Equipment**
Landis Machine Co., Inc., Waynesboro, Pa., has published an attractive booklet titled, "For the Ultimate in Modernization, Landisize Your Threads."

20. **Lathes**
A new Booklet, No. 88, profuse with illustrations, shows many interesting installations of South Bend Lathes. South Bend Lathe Works, South Bend, Indiana.

21. **Small Tools**
Brown & Sharpe Mfg. Co., Providence, R. I., has just announced the new small tools Catalog No. 33. Listings of small tools, cutters, screw machine tools, arbors, collets and miscellaneous shop equipment are included.

22. **Inspection Service**
Ford Motor Co., Johansson Div., Dearborn, Mich., has published a folder detailing and listing prices for inspection service for Johansson Gage Blocks and Accessories.

23. **Cut-Off and Miter Machines**
A new 4-page folder which describes and illustrates Tannewitz Metal Cut-Off and Miter Machines is available from The Tannewitz Works, Grand Rapids, Mich.

24. **High Cycle Electric Tools**
"What are the Facts about High Cycle Electric Tools?" is the title of a new 32-page edition just released by The Rotor Tool Co., Cleveland, Ohio.

25. **Lathe Speed Selector**
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis., has just released a new bulletin on selective automatic speed changing for Gisholt Turret Lathes.

26. **Super Line Reamers**
Bulletin 15-A gives details on McCrosky Super Adjustable Line Reamers manufactured by McCrosky Tool Corp., Meadville, Pa.

27. **Stud Setters**
Modern Tool Works, Rochester, N. Y., has issued a new bulletin M-185-A which describes Modern Stud Setters.

28. **Boring Tools**
Three new Bulletins Nos. 200, 300, and 500 have just been announced by Davis Boring Tool Co., St. Louis, Mo. No. 200 contains blue prints, No. 300 shows Block Type Boring Tools, and No. 500 illustrates the new Single-Point Boring Tool.

29. **Surface Grinder**
Blanchard Machine Co., 64 State St., Cambridge, Mass., has issued a 75-page work book showing how to handle surface grinding jobs most efficiently.

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The Covel No. 15 Hand Surface Grinder is the subject of a four-page folder issued by Coval Manufacturing Co., Benton Harbor, Mich. Advantages claimed for this machine are production profits, tool room savings, precision and accuracy, convenience, smooth silent power, and safety for the work. Specifications are included, together with a number of illustrations of the machine. Copy free upon request.

M.S.A. Bulletin Boards. Mine Safety Appliances Company, Pittsburgh, Pa., has issued an informative bulletin describing their specially designed bulletin boards for safety and general bulletins. These bulletin boards are used extensively by both large and small companies for supplementing safety and educational programs. They are sturdily built of 24-gauge steel, finished in green enamel, and are available in either single or double board types. Copy free upon request.

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United States Electric Tools Catalog No. 52. In this 72-page catalog The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio, presents the complete line of electric tools made by this firm. The line includes bench and floor buffers, buffer accessories and buffing wheels, electric drills, flexible shaft machines, tool post and angle plate grinders intended for use with various types of machine tools, swing frame grinders, tool grinders, bench and floor polishers, sanders, portable electric saws, tappers, valve seat grinders, and a wide variety of other tools of both portable and stationary types, together with the wheels, brushes, and other accessories to these tools.

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